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–
with man hand in hand!

Conference proceeding

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ARCTIC FOX IN ICELAND – PROTECTION OF FURRY TOURIST ATTRACTION

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Abstract
The Arctic foxes (*Vulpes lagopus*) live circumpolar in artic regions and it is the only native terrestrial mammal in Iceland, not only an animal of great beauty and elegance but a beast well adapted for a life in the kingdom of ice and cold as well. In Iceland, the population has got about 12000 individuals in autumn. The highest density of arctic fox in Europe can be found in Westfjords of Iceland, in the Hornstandir Nature Reserve. In the remote reserve, Arctic foxes have been protected since 1994. Here, in the area of 580 km^2, 40-50 pairs mate and hunt mainly on rich bird cliffs. Nature based tourism is an increasing industry in Iceland and the foxes of Hornstandir Nature Reserve are becoming more and more popular among visitors. The Arctic Fox Centre, established in 2007 in closeby village Súdavík, is a non-profit research and exhibition centre. The centre organizes a monitoring of the Hornstrandir Reserve fox population every summer season, studying parental behaviour and newly also the effect of tourists on fox life. The aim is to describe this effect and to find the balance between tourist interest and fox need of peace for their life.

Key words: Hornstrandir nature reserve, polar fox, nature based tourism

Introduction

The arctic fox (*Alopex lagopus*) is a small (3-4 kg) carnivore with a circumpolar distribution (Angerbjörn & Tannerfeldt 2014). The species is characteristic of the arctic but is also found as south as in Iceland where the species is the only native terrestrial mammal.
The arctic foxes of Iceland are true descendants of the ice age as they remained at the island as the ice cap redraw towards north thousands of years ago. The arctic foxes are found in two colour morphs, the "white" and the "blue". The white foxes are almost completely white in the winter but bi-coloured in the summer, dorsally brownish and ventrally whitish. The blue morph is dark brown and keeps its colour throughout the year but the sun bleaches the colour in late winter so it´s not easy to distinguish the colours in that time of the year. The white colour results from recessive allele, so blue parents can have both white and blue pups. White parents, however, have only white pups and mixed pairs have mixed pups (Arctic Fox Centre 2014).
The arctic foxes are found throughout Iceland but the density is probably highest in the Westfjords. The region has some of the largest bird cliffs of the country and proportionally longest coast line. It is likely that food availability is the most important explanatory factor in determining density but winter food is extremely important for sustaining the population (Unnsteinsdóttir & Hersteinsson 2013). In many other countries, the arctic foxes feed mainly on lemmings (*Lemmus sp.),* that are medium sized rodents and important food resource for arctic predators. There are no lemmings in Iceland and no competitive carnivores so the Icelandic arctic foxes have quite general food habits. The main food resources are birds and eggs, carrion, invertebrates and berries. Since the food abundance is highly seasonal, the foxes cache food for the winter. The coast is very important and a stable resource of edible things, such as carrion and various invertebrates, throughout the year (Arctic Fox Centre 2014).
Monitoring of the fox population in Hornstrandir Nature Reserve in Westfjords is annually organized by the Arctic Fox Centre. The centre is focused on the arctic fox and it was established as a non-profit research and educational institution by Prof. Páll Hersteinsson (1952-2011) and Ester R. Unnsteinsdóttir in 2007. IThe centre has got its seat in the area of Westfjords of Iceland in Súðavík from June 2010. The main purpose is education – exhibition about the arctic fox and research. Other activities are represented by coffee shop, tourist information centre and the centre of social life in a village with 150 inhabitants in general. The centre organizes a monitoring of the Hornstrandir population every summer season, studying parental behaviour and the tourist effect on fox life.

Tourism in the Hornstrandir Nature Reserve

The Hornstrandir Nature Reserve is one of few regions where the arctic foxes are protected in Iceland. The protection took place in the spring 1994 but until then, organized "den-hunting" had been performed in ages. Due to the protection, the arctic foxes in Hornstrandir have become tame and curious of the people passing by during the summer. Likewise, the tourists are interested in the foxes and their photogenic nature (Arctic Fox Centre 2014).

The growth of ecotourism in the Westfjords not only brings new ways of economic revenue but also potential threats for the fragile wildlife within the area (Isaacs 2000), especially in biodiversity reservoirs. The increase of tourism in the Westfjords of Iceland has great potential for positive development (Madrigal & Kühn 2014). Overall, tourism in the area has increased since 1999. A total of 12,714 tourists stayed on average 1.4 nights in the area in 1999. By 2012, the total overnight stays in the Westfjords went up to 77,062, with an average stay of 1.7 nights (Statistics Iceland 2014). This increase in tourism can be both economically and ecologically beneficial, because it can provide a source of revenue that can be invested in the development of local communities and nature preservation (Madrigal & Kühn 2014). However, the effect of increased tourism on the wildlife and nature of the area is unknown. If the tourism industry is not properly managed, it can degrade the area and create conflict between conservation and development (Isaacs 2000). The negative effects of tourism on fragile areas such as the Hornstrandir Nature Reserve is a great concern.

Fig.1: Arctic Fox Centre in Súðavík (foto:author)

Fig.2: Orphaned puppy, white morph (foto:author)

Research

The Hornstrandir Nature Reserve is in a remote peninsula of the North-Westfjords, giving it some conservation advantages such as limited access to the area, and a controlled flow of tourists. Both of these advantages, make it possible to study tourist behaviour within the area (Madrigal & Kühn 2014).
Taking into consideration increasing tourist interest in the area, the reseach of the effects of tourist on fox parental behaviour started in 2008. First study focused on parental behaviour of adult fox pair during summer, when tourist and fox activity were monitored during five consecutive days every month (Unnsteinsdóttir 2014).
First results show some changes: longer time in the den or increased scent marking and decreased barking in the time of tourist activities (Unnsteinsdóttir 2014). Even though more and longer monitoring periods are needed to be able to explain properly the tourist effect, it is obvious that tourist visits and their activity control and cooperation with local tourist guides will be neccesary for satisfied foxes and thus sustainable management of the reserve.

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Souhrn
Liška polární je jediným původním suchozemským savcem Islandu. Nejpočetnější populace je v oblasti západních fjordů, a to v rezervaci Hornstrandir. Tato rezervace byla vyhlášena roku 1975 a dnes je nejdůležitějším útočištěm pro lišky polární v zemi. Rozkládá se na 580 km^2 poloostrova a žije v ní přibližně 40-50 rozmnožujících se párů. Území, které od 40. let 20. století není obydleno a jehož návštěva je možná pouze lodí, případně nekolikadenním náročným pochodem, představuje se svými útesy bohatými na hnízdící ptáky ideální prostředí pro lišku, a tak i pro její pozorování.
Centrum zaměřené výhradně na polární lišky (Arctic Fox Centre) sídlí od roku 2010 v oblasti západních fjordů Islandu, ve vesničce Súðavík. Bylo založeno jako nezisková výzkumná a vzdělávací instituce v roce 2007 Prof. Pállem Hersteinssonem (1952-2011) a jeho studentkou Ester R. Unnsteinsdóttir, předními islandskými odborníky na lišku polární. Mezi hlavní programovou náplň centra patří vzdělávací činnost - expozice o liškách a výzkum. Doplňkovými činnostmi jsou provoz kavárny, turistického informačního centra a centra společenského dění obce se 150 obyvateli vůbec.
V průběhu letních měsíců centrum každoročně organizuje monitoring populace lišek v přírodní rezervaci Hornstrandir. Monitoring zahrnuje například stanovení hustoty populace, využití nor nebo efekt turismu na chování norujících lišek. Lišky jsou pro turisty velkým lákadlem, čímž se zachování Hornstrandirské populace stává veřejným zájmem a faktorem rozvoje regionu. Vzhledem ke zvyšující se popularitě a návštěvnosti rezervace byl v roce 2008 započat výzkum zaměřen na vliv turistů na rozmnožovací a rodičovské chování lišek. Prvotní výsledky odhalují změny v chování lišek, delší čas strávený v noře, zvýšenou míru pachového teritoriálního značení a méně teritoriálního štěkání. Ukazuje se, že regulace turistické návštěvnosti či pohybu návštěvníků rezervace a spolupráce s místními průvodci bude nejen pro spokojený život lišek, a tím zachování jedinečného charakteru rezervace, nutností.

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ASSESSING INFORMAL TRAIL NETWORKS IMPACTS ON PROTECTED AREAS LANDSCAPES: A CASE-STUDY FROM PORTUGAL

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Abstract
Visitor-created informal trails, sometimes referred to as "social trails", represent an important threat to the visitor experiences and natural resources of recreational areas by removing vegetation, moving wildlife, altering the hydrological cycle, introducing invasive species and fragmenting landscapes. This paper presents the preliminary stage of a project that intends to develop the current understanding of informal trails and their potential impacts on protected natural landscapes. The methodological approach has its application in a Portuguese protected area, the Arrábida Natural Park, and consists of three sub-steps: (1) collection of GPS-based data from a webshare service based on a WebGIS and a spatial analysis using a geographic information system; (2) an on-site visual survey of informal trails using condition class assessment method; and (3) an assessment of the diversity of trail-based fragmentation across the area using landscape fragmentation metrics to summarize the relative impacts on a landscape scale. When using the proposed approach it will be possible to produce a comprehensive coverage of information with reasonably high accuracy about the absolute and relative levels of impacts from informal trails at the landscape scale (fragmentation indices) and at the local scale (trails condition assessment).

Key words: trail networks; assessing trail impacts; webshare platforms; Global information systems, Arrábida Natural Park.

Introduction

With increasing numbers of visitors engaging in protected area activities, potential environmental impacts can appear on trails where recreation activities are performed most of the time (Marion and Leung, 2001).

Formal trail networks can minimize visitor impacts and curtail widespread degradation by concentrating use on appropriate walking surfaces. (Marion and Leung, 2004). However, when formal trail networks fail to provide the desired access and experiences, visitors tend to venture off-trail, leading to the creation of informal trails due to foot trampling (Wimpey and Marion, 2010). This type of impact can affect ecosystem components through the removal of vegetation, displacement of wildlife, alteration of hydrology, spread of invasive species and can also exacerbate ecological fragmentation effects by expanding the influence into relatively undisturbed habitats (Wimpey and Marion, 2010; Walden-Schreiner et al, 2012).

Creation and proliferation of informal trails can be characterized according to their spatial scale, patterns of distribution, motivation of trail users, and the types of environmental impacts (Walden-Schreiner et al, 2012). Although, even if they are present in nearly all protected areas, research focused on informal trail networks remains mainly absent (Marion et al., 2006). This may be due to the fact, that informal trail segments are often comparatively numerous, short, and frequently disposed in complex patterns, creating sampling and assessment difficulties (Leung and Marion, 1999).

Through the years, informal trails mapping and on-site monitoring were commonly performed by using a hand held Global Positioning System (GPS) unit and covering the entire trail system networks by walk (Wimpey and Marion, 2011). Since limited human and financial resources are a major constraint of protected area management this technique is many times costly in terms of time and resources invested. However, nowadays, a new source of data is available based on GPS-based data from webshare services and can be used to understand the patterns of visitor movements. In this way, it is possible to identifying the spatial distribution of informal trails as a result of recreation use in a effectively, cheap and accurate way.

This paper presents the preliminary stage of a project that intends to develop the current understanding of informal trails and their potential impacts on protected natural landscapes. Specifically, it provides an introduction to the project and presents the results of the preliminary stage: GPS data collection from a free webshare service based on a WebGIS, and spatial analysis of GPS tracks using a Global Information Systems (GIS).

Study area

The proposed methodological approach has its application in the Arrábida Natural Park (PNA), an important protected area in Portugal, with 17 653 ha, located 37 km south of Lisbon (Figure 1). The entire area represents an important tourism and recreation destination, mainly due to its coastal and mountainous scenery and special location within Lisbon Metropolitan Area (near 2.5 million inhabitants).

Fig. 1: Location of Arrábida Natural Park

Material and methods

To achieve the proposed objectives and because the research is on its preliminary stage, this conference paper provides an introduction to the project by presenting its first sub-step: the collection of GPS data from GPSies.com (GPSies) and their spatial analysis using a GIS. Thus, in order to characterize the spatial distribution of visitor-created trails within the PNA limits a main dataset was collected from GPSies website, a free webshare service containing GPS tracks from visitors who wanted to share their movements. Each track is classified within 32 different activities, length, altitude profile, category and can be and downloaded in a variety of formats.

Search queries on GPSies were conducted on March 19th 2015, using a radius of 25 km from Palmela and considering no more than 10 activities (hiking, mountain biking, walking, motor biking, sightseeing, running, cycling, climbing, geocaching and racing bike). However, in order to ensure that all submitted tracks were downloaded, a selective track length was used, to limit each query to less than 250 tracks. This is due to the fact that the website restricts downloads to a maximum of 250 tracks, limiting the time window for each dataset if the query result is a higher number.

All tracks were downloaded in a "gpx" format and then converted into shape-files for editing and analyses using a GIS software with the aim to eliminate duplicate results. This allowed create a shape-file with the entire trail networks based on GPSies users tracks. After the elimination of duplicates, the park boundary polygon was used as a base layer and all tracks that overlaid the official park infrastructure, including official road and trail network, were removed. The result was a final shape-file compiling all potential informal trails. Besides, for absorb the GPS spatial errors of tracks collected by assisted GPS cell and smartphones, under different atmospheric conditions and canopy cover, a 15 trail width buffers was created. Removal of buffered tracks was accomplished using ArcMAP 10.3 by selecting and removing tracks that intercepted each park infrastructure. The result was a shape files representing all park's potential informal trails that will be used on the subsequent phases. Finally the results were overlaid with the park zonation plan to summarize the lineal extent informal trails in different management zones of the park.

Results and discussion

Following the considered search queries and after the elimination of duplicates, the total dataset downloaded consisted of 7157 individual tracks, representing a total accumulated of 52 744.8 km, with 4004 tracks (56%) passing through the study area. This final dataset was submitted from March 2006 to March 2015 by 408 identified users that upload 6632 tracks and the remained by 105 anonymous. The large number of users and their varied sources demonstrates the high attraction of PNA for its trail networks.

Regarding the extension of the trail network, based on GPSies users tracks, a total of 8230 km are contained within PNA limits and approximately 85% intersected the official road and paths networks. From this, 7007.3 km are considered formal park infrastructure and 1223 km might configure illegal trails - potential informal trails - that will be assessed on the subsequent phase (Table 1). The results

shows that despite most users prefer to use the official park infrastructure, illegal use of trails and paths network is still happening leading to the creation and proliferation of visitor-created informal trails.
When plotting results against park zonation plan, 51% of the potential informal network is on complementary protection, 36% on partial protection and the remain 13% on full protection. This results represent all potential management conflicts between current uses and each management zone.

Tab. 1: Summary of formal and informal tracks

Track type	N	Length (km)
Formal infrastructure	20302	7007
Potential informal trails	17076	1223

Conclusion
The demand for the practice of outdoor recreation activities in protected areas is increasing and because most of these activities are concentrated on trails, potential impacts can appear on local condition leading to a decrease on the quality of visitors experience. Besides, once research regarding informal trails remains mainly absent, it becomes essential to have a clear and objective methodology with common principles, to better examined their effects in protected landscapes.
In this case, accurate and low-cost voluntary geographical data showed to provide important clues regarding how the territory is being used, making it a valuable tool to evaluate the ecological significance and fragmentation effects of trail networks. Like this sustainable management action can be instigated in order to minimize the creation and proliferation of visitor-created informal trails as a result of outdoor activities within recreational and protected areas.

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Souhrn
Stále vzrůstající počet návštěvníků chráněných oblastí má zásadní dopad na dané prostředí. Tyto dopady jsou koncentrovány v okolí cest (Marion a Leung, 2001). Pokud však není zajištěn dostatek cest, dochází k pohybu návštěvníků mimo místa určená k pohybu. Tito návštěvníci pak mají tendence opouštět běžné trasy a vytvářet neformální cesty – vyšlapáváním (Wimpey a Marion, 2010). V chráněných oblastech pak mají tyto vyšlapané stezky přímý dopad na citlivá rostlinná společenstva, na vzácné druhy flóry fauny volně žijících živočichů a historické/archeologické památky (Hammitt a Cole, 1998; Leugh a Marion, 2000).
I když existuje celá řada výzkumů zabývajících se právě chráněnými oblastmi, výzkum zabývající se problematikou neformálních cest zcela chybí (Marion a kol., 2006). Z tohoto důvodu je článek zaměřen právě na tuto problematiku a je úmyslem rozvíjet zde současné chápání neformálních cest a jejich možných dopadů na chráněné oblasti s ukázkou konkrétního příkladu Přírodního parku Arrábia (PPA), což je důležitá chráněná oblast v Portugalsku. Výzkum je zde prezentován ve formě výsledků první fáze projektu: sběr GPS dat pomocí GPSies.com (GPSies) a webovou službou poskytovanou zdarma a založenou na WebGIS; s následnou geoprostorovou analýzou pomocí systému Global Information Systems (GIS).
Pro možnost charakterizovat území z hlediska rozložení pohybu návštěvníků mimo určené trasy v PPA, proběhl 19. března 2015 sběr dat pomocí GPSies. Celkový datový soubor byl tvořen 7157 jednotlivými trasami s celkovou délkou 52 744,8 km zahrnující 4004 tras (56 %), které se nachází ve zkoumané oblasti. Po odstranění duplicitních tras a oficiálních tras tvořících infrastrukturu parku vznikl výsledný soubor (shapefile) cest obsahující pouze neformální trasy. Celkově tedy oficiální trasy představují délku 7007,3 km a ty neoficiální (ilegální) trasy tvoří délku 1223 km. Právě ty budou posuzovány v další fázi výzkumu. Při vykreslování neformálních tras v porovnání se zonací chráněné oblasti parku, 13 % těchto tras zasahuje do zón s největší ochranou.
V tomto případě byla použita volně přístupná zeměpisná data, která poskytla důležité informace o využití území, takže je možné je využít jako cenný nástroj pro hodnocení ekologické významnosti a negativní dopady cest, jež způsobují fragmentaci území. Díky tomu mohou být navržena opatření, která povedou k minimalizaci pohybu návštěvníků mimo určené trasy s následným vytvářením neoficiálních cest v důsledku rekreace a jiných sportovních aktivit v chráněných oblastech.

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AVALANCHES IN JESENÍKY MOUNTAINS

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Abstract
The avalanches occurrence in Czech Republic can not be compared with Alpine countries but on the other hand the avalanches also occur in theCzech mountains and represent an objective danger. Winter sports and mountaineering are the integral part of recreation, mainly in the highest parts of the Giant Mountains National Park and Protected Landscape Area Jeseníky. There are zones, where avalanches in human interaction represent considerable risks. The avalanche prevention thus predicting the risk of avalanches in the specific areas is essential for the avalanches risk reduction.
Computing models of the avalanches break off zones were performed by equations in ArcGis 10.2 software. Modeling potential break off zones is used for identifying sites, where is the highest probability of the avalanches formation. This fact follows modeling of the avalanche paths in programme RAMMs (Rapid Mass Movement System), where the quality of input data is key for the avalanche paths simulation.Model results enable to predict speed, pressure and mainly the amount of material which possibly sline down.

Key words: avalanches, Jeseniky Mountains, break off zones

Introduction

On the PLA Mountains National Nature Reserve Praděd is situated a specific part of the mountain range. Treeless rocky amphitheater which is wedged deep into the forest. This glacial valley is called the Velká kotlina and attracts visitors with its natural beauty as a source of inspiration, mental refreshment or stimulus for overcoming limits. This mountain area is despite big touristic pressure one of the last places where nature has preserved its natural character. Climatic conditions in this area could be consider as an extreme whole year. But the grandeur and glory of this place still attracts visitors, tourists and sportsmen. When moving in mountains is necessary to ensure the safety, because any underestimation of the situation in these conditions could have tragic consequences.
Very dangerous phenomenon in winter period are avalanches. The avalanches cause a significant risk of movement in mountains. The Velka kotlina has six registered avalanche paths. From 1953 on these paths have recorded almost all of avalanche landslide, according to international classification. Characteristics of individual pathways and their spatial depiction are also part of the classification.
Software ArcGIS 10.2, with its functions is appropriate tool for modeling avalanche vulnerability. Software RAMMS 1. 6. 20 serves exclusively for modeling avalanche pathways. Critical for the resulting simulation is Quality of input data in both these programs. It should be noted that break off zones were based on the model created in the ArcGIS 10.2.
The purpose is according to the chosen methodology create a possible break off zones, classify them into three categories of endangerment and according to available data to model potential avalanche paths.

Materials and methods

Processing of break off zones digital model, avalanche paths simulation and their impact on the Velká kotlina consists of several consecutive steps. The first step was to obtain input data for modeling break off zones. Input data were obtained by airborne laser scanning as a digital elevation model of the fifth generation (5G DMR).
Land cover data were based on digital surface model of the first generation (1G DMP). In classification process of airborne laser scanning data some errors occured - mostly on bare rocks with slope more than 45 °. The DMP 1G had to be adjusted by comparison with orthophoto images obtained from the CUZK in the program Terra scan. The layers which seemed like a mature tree stands were reclassify to values corresponding to bare rocks.
After data editing a statistical model of potential break off zones was processed. Then a digital terrain model was created. From the DMT were derived layers as inputs to the model (slope, altitude, vertical and horizontal curvature, relief exposure), and digital surface model layer with the coordinates x, y, z of which may be reclassified different types of surface. The actual calculation required to reclassify each factors that enter the equation. The created avalanche danger model was also used to simulate avalanche paths and scope of the various avalanches in the program RAMMS (Rapid Mass Movement System).

Results

Key factor for calculating the avalanche danger is input data resolution and map of the surface area structure. In the process the digital surface model (DMP 1G) was used to create a map of the surface structure of the territory in all cases, The reclassifications distinguished different heights of rock and vegetation stands whether grass, shrub, or tree. The largest representation of avalanche danger was in medium vulnerability category (77% of the area). Maximum vulnerability is represented by 21% of the area and catastrophic vulnerability on the rocks by 2% of the area. Then the areas of potential avalanches break off zones were transferred into the program RAMMS 1. 6.20. Break off zones of individual selected avalanche pathaways was created on the basis of statistical information recorded by mountain rescue service and potential break off zones.

Discussion

Currently new technologies and software development allows usage for avalanche issues as a different models creation, visualization, and statistical analyzes. Creation and visualization of models in this work was carried out from elevation data by Surveying Office.

Hreško (1998) developed a model used to determine the avalanches break off zones. As the most important variables entering the equation was chosen a surface roughness. Methodology according to the Bárek and Rybár (2003) and subsequently Biskupič (2008) added as the most important variables slope in addition to the factor of surface roughness. The slope is considered as a primary topographical factor for avalanches formation. The results of break off zones in the Velká kotlina showed that the most represented is medium vulnerability of avalanche. This area with medium vulnerability is located on the slope with inclination of 30 ° - 50 °. The rocks and grassland 10-20 cm high are represented on the model surface with this vulnerability. This surface has according the methodology by Bárka and Rybár (2003) and Biskupič (2008), the highest value for avalanches.

The parameters which have the most influence on the results besides the input data details, are snow depth in the break off zone and pull of snow in the avalanche path. Accurately would be to establish the detailed distribution of snow in the break off zone for a single grid cell. This step would, however, require detailed meteorological data of wind direction and intensity before the avalanches fall and at the same time data of the snowfall intensity in the period after . Some Swiss avalanche professionals (from Eidg. Schnee- und Institut für Lawinenforschung, Weissfluhjoch, Davos) expressed doubt that the direct measurement of mechanical parameters of snow avalanche on a slope will lead in the future to exact avalanche forecasts. Practical implementation of such work appears as impractical to them.

In the software RAMMS a simulation of avalanche with the largest volume registered during the years 1953 – 2013 was also carried out. The avalanche fell in the spring of 2005 and measured volume by Mountain Rescue Service at Ovčárna was 60,000 m^3. The simulated volume reached the value of 48,000 m^3, so the simulation undervalued it by 20%. Bártík et al. (2013) reported in their study that the changes in the alpine treeline could have potential impact on the avalanches parameters by using the model Elba +, the simulation undervalued avalanche by 10%. It should be noted that the model Elba i + and RAMMS. 1.6.20. are based on the same principle of Voellmy`s friction equation. In assessing the feasibility of the simulation results is needed to carry out any calibration modeling, or explore the reality of the situation, using historical data or traces of avalanche activity in the environment.

Conclusion

The aim of the study was in GIS map a potential break off zone of avalanches in the Velká kotlina. After necessary adjustments of the input data (transfers, thinning, filtering), all analysis were carried out in ArcGIS 10.2 software focused on parameters of break off zones. The used equation is composed of topographic characteristics derived from the recorded avalanches. In particular, the analysis of altitude, relief exposure, terrain curvature, terrain slope and roughness were carried out. The result from model was used as a basis for individual avalanches modeling.

The results of this work can be applied in areas such as avalanche prevention. Despite the number of avalanche fields and regular influx of visitors to the mountains in winter, it can be stated that the number of avalanche disasters in the Jeseníky mountains is quite negligible. It's certainly a direct result of security and administrative measures by Mountain Rescue Service. These include besides the technical equipment and personal training for rapid interventions mainly preventive measures, of which the greatest emphasis is on avalanche forecasting service. So in the rest of the PLA Jeseníky avalanche forecasting service could be established in the context of the results.

These results can also be used for floristic and phytosociological surveys of differences on break off zones, pathaway and avalanches lodgement. The account can be taken of the avalanches reconstruction and their impact on the local landscape and influence of anemo-orographic systems on avalanches.

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Souhrn
Při výpočtu lavinového ohrožení, je zásadní, rozlišení vstupních dat a mapa struktury povrchu území. Při tvorbě této práce byl, pro vytvoření mapy povrchu struktury území ve všech případech využit digitální model povrchu (DMP 1G), jehož reklasifikací byly odlišeny jednotlivé výšky skalních ohlazů a porostů vegetace ať už travních, keřových, či stromových. Největší zastoupení lavinového ohrožení má kategorie střední ohroženosti (77% plochy). Velká ohroženost je zastoupena 21% plochy a katastrofická ohroženost na skalních ohlazech 2% plochy. Plochy potencionálního odtrhu lavin byly následně převedeny do programu RAMMS 1.6.20. Zde se na základě statistických informací evidovaných horskou službou a potenciálních odtrhových ploch vytvořila místa odtrhu jednotlivých vybraných lavin.
Zjištěné výsledky této práce se mohou uplatnit například v oblasti lavinové prevence. Přes počet lavinových polí i přes pravidelný příliv návštěvníků hor v zimním období, lze konstatovat, že počet lavinových neštěstí v Jeseníkách je celkem nepatrný. Je to bezpochyby přímý důsledek řady bezpečnostních a organizačních opatření Horské služby. Patří k nim vedle technického vybavení a osobního výcviku k rychlým lavinovým zásahům především preventivní opatření, z nichž největší důraz se klade na lavinovou předpovědní službu. Právě v rámci lavinové předpovědní služby může být na výsledky navázáno ve zbytku území CHKO Jeseníky.

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CULTIVATION OF ENDANGERED PLANT SPECIES AS THE REGIONAL PRODUCT

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Abstract
This paper introduces the idea of the cultivation of endangered species, which are listed in the Red List of Czech vascular plants. Case studies in the Moravian Karst Landscape Protected Area and the Jeseniky Landscape Protected Area are part of the research. The use of the regional mark "Jeseniky Original Product" and "Moravian Karst Original Product" for planted endangered species is discussed and supported by a local community questionnaire.

Key words: biodiversity, Moravian Karst, Jeseniky Landscape Protected Area, Red List, regional product

Introduction
Strengthening local populations of endangered plant species with importance for local communities is the main aim of this paper. We describe the various threat levels for vascular plants and legislation related to their handling. An area in the northern part of Moravia – " Jeseniky Landscape Protected Area ", and an area north of the second largest city in the Czech Republic, Brno - "Moravian Karst Landscape Protected Area" were chosen. The work focuses on identifying endangered species grown by locals as ornamentals on their land in selected communities. The study deals with legislative restrictions in the management of endangered plant species and suggests possible careful regional use of them. Some of planted ornamental taxa, commonly visible in gardens of local people, belong to endangered species of regional origin and no longer exist in the wild, being extinct. Locally planted and carefully cared for they could help reintroduction into the wild. Supervision by the local environmental agency is a must, however.

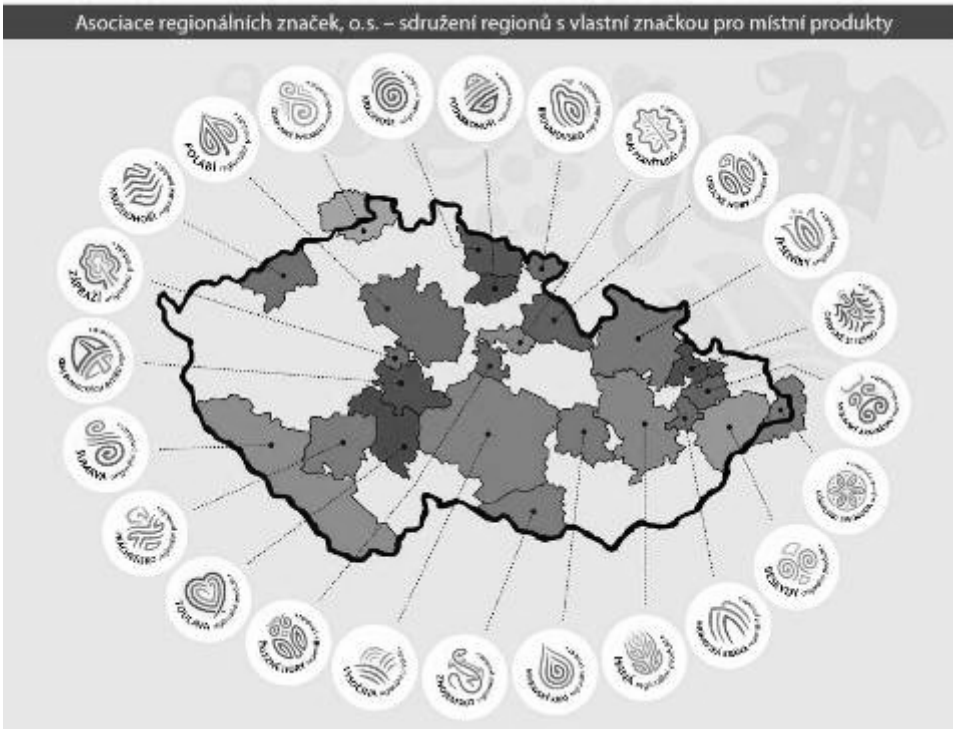

Fig. 1: Regional product logos of Czech Republic (http://www.regionalni-znacky.cz/)

Materials and methods
Two protected areas (IUCN category V) were chosen: Jeseniky Landscape Protected Area (LPA) and Moravian Karst Landscape Protected Area. Both areas lie in Moravia, the eastern part of the Czech Republic. The potential for the growing of ornamental endangered species with the regional mark "Jeseniky original product" or "Moravian Karst original product" respectively were studied. The Red

Lists of plant species (Procházka 2001, Grulich 2012) were used. The Czech Red List uses four criteria:
C1 critically endangered species
C2 highly endangered species
C3 endangered species
C4 vulnerable species

There is no regional Red List in Moravian Karst LPA. In Jeseniky LPA the local Red List has been published (Bureš, 2010) and has these criteria:

E critically endangered species
R highly endangered species
V endangered species
I vulnerable species

The criteria for the taxa chosen were as follows.
1. Species not under critical threat of extinction
2. Species are ornamental
3. Species are easily planted

Personal research in the villages of the Moravian Karst LPA using questionnaires was undertaken, but not in Jeseníky LPA. Five villages in the central part of the Moravian Karst were chosen: Jedovnice, Křtiny, Lažánky, Rudice and Vilémovice. Endangered plants in gardens and local people's interest in certified locally produced ornamental plants were studied.

Results
Based on personal research using questionnaires in five villages of the Moravian Karst (Jedovnice, Křtiny, Lažánky, Rudice and Vilémovice), endangered plant species according to the Red List of vascular plants of the Czech Republic (Procházka, 2001; Grulich, 2012) cultivated by the locals were researched. 17 species were found (see Table 1).

Tab. 1: Cultivated endangered species of the Moravian Karst LPA in gardens

Species	Czech Red List (Grulich 2012)
Adonis vernalis	C2b
Anemone sylvestris	C2b
Aquilegia vulgaris	C3
Aster amellus	C3
Cornus mas	C4a
Dictamnus albus	C3
Galanthus nivalis	C3
Iris sibirica	C3
Leucojum vernum	C3
Lilium martagon	C4a
Menyanthes trifoliata	C3
Nymphaea alba	C1
Pulsatila grandis	C2b
Ribes alpinum	C4a
Saxifraga panniculata	C3
Taxus baccata	C3
Trollius altissimus	C3

Although some of locally cultivated plant species are common in the Moravian Karst LPA (*Cornus mas, Lilium martagon*), most of them are very rare (*Aquilegia vulgaris, Galanthus nivalis, Ribes alpinum, Saxifraga panniculata, Taxus baccata* and *Trollius altissimus)* or extinct here.

Horský (2012) describes the population of *Taxus baccata* in the southern part of the Moravian Karst, where there is the Training Forest Enterprise (TFE) Křtiny of Mendel University, as less than 100 individuals highly damaged by game grazing. The endangered species of the TFE nature reserves were published by Jelínek (2009).
Some cultivated species are either extinct or in the last wild locality of the Moravian Karst LPA. Kučerová (2009) shows the last population of *Leucojum vernum* near Jedovnice. In contrast the species is very commonly planted in all the surveyed villages and its cultivation is easy which is also the case of *Iris sibirica.* This taxon also grows in the last wild place near Křtiny Arboretum. Being a marshland species, people plant it near garden ponds together with *Nymphaea alba* and *Menyanthes trifoliata,* another endangered species of the Moravian Karst, extinct in this part of the region. Wild localities are rare in the north of the LPA.
Another group of taxa commonly planted by villagers are xeromorphic ones, which are all extinct in this central part of the Moravian Karst LPA. *Adonis vernalis, Anemone sylvestris, Aster amellus, Dictamnus albus* and *Pulsatila grandis* are all found in the gardens of the villages surveyed, but no longer grow wild in the Moravian Karst except the most southern steppes and open forest of the Hády nature reserve (3 indviduals of *Pulsatila grandis* grow also in Cihadlo nature reserve*). Adonis vernalis* is found only in the Moravian Karst LPA locality mentioned by Vaněčková (1997) near Hostěnice from 1979. Another locality in Hady was destroyed by limestone quarrying.
Based on questionnaire research in the villages of the Moravian Karst on endangered plant species, people would appreciate the sale of these plants. Most people asked answered positively in Křtiny and less positively in Lažánky. In Křtiny ¾ claimed they would buy certified endangered ornamental plants with the logo of the regional product.

Fig. 2: Wollemia nobilis cone (http://www.wikipedia.org)

Fig. 3: Wollemia nobilis sapling to sell (http://www.wikipedia.org)

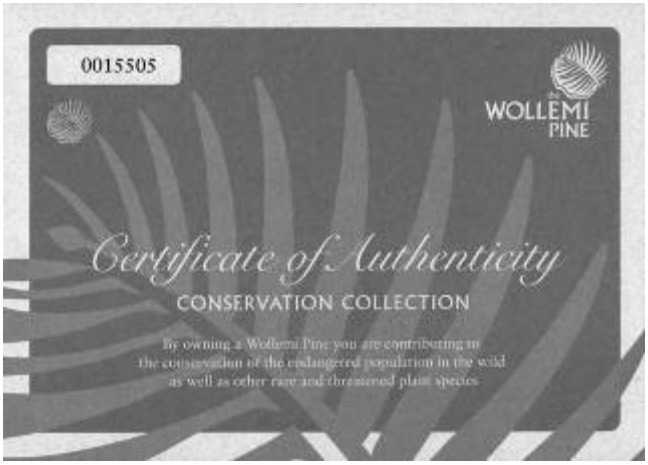

Fig. 4: Wollemia nobilis certificate (http://www.sustainable-gardening-tips.com)

Tables 2 and 3 show ten chosen plant species which we believe to be suitable for cultivation as a regional product of Jeseniky or the Moravian Karst respectively.

Tab. 2: Endangered species for Jeseniky LPA cultivation

Species	**Czech Red List (Procházka, 2010)/Jeseníky Red List (Bureš, 2010)**
Aquilegia vulgaris	C3/V
Campanula barbata	C2/I
Daphne mezereum	C4a/V
Gentiana punctata	C1/R
Gentiana verna	C1/E
Gladiolus imbricatus	C2/V
Hieracium villosum	C1/E
Lilium bulbiferum	C2/V
Saxifraga paniculata	C3/E
Trollius altissimus	C3/V

Tab. 3: Endangered species for Moravian Karst LPA cultivation

Species	**Czech Red List (Procházka, 2010)**
Aster amellus	C3
Cornus mas	C4a
Dictamnus albus	C3
Galanthus nivalis	C3
Leucojum vernum	C3
Linum tenuifolium	C3
Lilium martagon	C4a
Pulsatila grandis	C2
Rosa pimpinellifolia	C2
Taxus baccata	C3

Discussion

Act No. 114/1992 Coll. on Nature and Landscape Protection placed legislative restrictions on dealing in these species. Cultivating endangered taxa listed under Czech law is possible only with the permission of the nature protection authorities and only in the case that the state of the taxon will not

get worse. If approved for sale, a local company could sell the product even when coming from the wild.
Doing business in rare plants raises a number of questions. As mentioned earlier, the wild community of many plants of the Moravian Karst or Jeseníky has decreased, dramatically in some taxa. That is why we believe some precisely defined categories of endangered species could benefit from cultivation. Also some foreign experience supports the idea. Keel, Langenauer, Marti and Gigon (2009) describe the conservation effort of 85 private people who participated in cultivating 75 local endangered plant species near Zurich, Switzerland. Offord and Meagher (2006) from Australia price the marketing and cultivation of ancient tree species *Wollemia nobilis* (*Araucariaceae* family) newly found as late as in 1994 in Wollemi National Park, only 150 km from Sydney.
Both positive and negative opinions in the Czech research community on cultivating species are described by Buksová (2011). Some botanists welcome the idea whereas others fear further degradation of the natural localities where endangered species grow.

Conclusion
Cultivating endangered plant species for the purpose of saving them is discussed in this paper. Although we have established protected areas and environmental legislation, quite a few endangered plant species continue to disappear. As the case study from the Moravian Karst Landscape Protected Area shows, some of them are widely grown in the gardens of local Moravian Karst people, many of them extinct in the wild in the region. An environmentally friendly means of cultivation of endangered species could help the local wild plant communities, and in some cases could even mean the return of already locally extinct species. Ten species for Moravian Karst LPA and ten species for Jeseníky LPA are recommended for cultivation under the logo of Original Regional Product, known for both areas. This proposal is supported by concerned residents who want to buy such products as shown by the results from the questionnaires from the Moravian Karst villages.

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Souhrn
Pěstování ohrožených druhů rostlin jako způsob jejich ochrany. V Chráněné krajinné oblasti (CHKO) Moravský kras a CHKO Jeseníky navrhujeme 10 ohrožených druhů rostlin vhodných k pěstování, což může být způsob, jak těmto rostlinám v území pomoci. Využití značek regionálního produktu (Regionální produkt Jeseníků a Regionální produkt Moravského krasu) pod přísnou kontrolou Správy CHKO Moravský kras a Správy CHKO Jeseníky. Protože obyvatelé stejně mnohé z navržených druhů pěstují na zahrádkách, mohla by certifikace nějakého pěstitele v regionu přispět k jejich ochraně na divokých stanovištích.

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DIFFERENCES IN THE NATURAL AREAS PROTECTION IN THE CZECH REPUBLIC AND ROMANIA: A SOCIOECONOMIC VIEW

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Abstract
The paper is focused on the differences in the natural areas protection in the Czech Republic (CR) and Romania, considering the socioeconomic perspective. Further, the main aspects of nature conservation in both countries are discussed. They result from differences in economic and political development, and different natural conditions in both countries. The total area under protection in Czech Republic is 1.28 million hectares (16.2% of the territory) and in Romania 5.57 million hectares (23.4%). In both countries, the nature conservation is focused mainly on large-scale protected areas. In these areas there are constant interactions between local people and the natural environment. Therefore, such areas represent places with high social and economic value. In the CR, the large-scale protected areas include mainly national parks and protected landscape areas. In total these protected areas cover about 15.5% of the territory. In Romania national and natural parks cover 4.6% of the territory (not including the Danube Delta). The article deals with the European context of nature conservation and outlines specific differences in the nature protection legislation in both countries. It also focuses on organizations dealing with large-scale protected areas management and problems resulting from the interaction of nature conservation and local residents.

Key words: environmental economics, recreation function, natural areas management, Czech Republic, Romania

Introduction

The protection of natural areas remains a persistent effort on European level, and significant changes were made on the subject of their objectives. Maintaining the integrity and functions of natural areas needs constant protection efforts, and the protected areas (PAs) are the foundation of conservation (Joppa et al. 2008). Currently, the nature conservation is focused mainly on large-scale protected areas (Cantu-Salazar et al. 2010) and the main priority is considered the environmental protection. But the idea of classic conservation is now enriched by the concept of sustainable development (Brundtland 1987) which focuses not only on environment, but on economics and social pillars.
Europe faces a new paradigm for PAs which starts to change the standard environmental policies. The new concept accepts PAs not just as conservation units but as genuine 'living landscapes' (Mose and Weixlbaumer 2007). In this ways activities such as tourism, education, forestry or even agriculture are integrated and supported in order to guarantee the sustainability. The European Habitats Directive (92/43/CEE) specifies that conservation measures should take into account the social and economic aspects at local or regional level.
The idea of nature protection as an instrument for local or regional development can be easily assimilated from the socioeconomic perspective if we consider the protected area as a commodity used to produce, for example, tourism experiences (Byström and Müller 2014). It is obvious that the main benefits of PAs consist in preserving biodiversity, wilderness and wildlife habitat. But PAs benefits can be expanded to generate incomes from sales of products or services, opportunities for education, recreation and tourism (Kettunen and ten Brink 2013). The PAs recreation function is one of the key socioeconomic functions (Zandersen and Tol 2009), nevertheless still generates debates.
Two different European countries were selected for the current analysis – the Czech Republic (CR) and Romania. The paper compares some selected socioeconomic aspects regarding natural areas protection focusing on the PAs management and financing problems, along with the aspects concerning the interaction between nature conservation and local communities.

Material and methods

Relevant data material was obtained from a secondary research, on the basis of an analysis of available scientific literature dealing with socioeconomic value and benefits of protected areas. National and European database and statistics on PAs were consulted, offered by sources such as: World Database on Protected Areas (WDPA), United Nations List of Protected Areas (UN List), Official website of European Union, Czech Statistical Office (CSO), Digital Register of the Nature

Conservancy Czech Republic (DRNC), financial and accounting reports from the Ministry of Finance (for the CR), National Statistical Institute, National Forest Administration (RNP), Ministry of Environment, Water and Forests, Natura 2000 (for Romania).
There were made basic comparison at national level and assessment of differences concerning European nature protection legislations, economic and policy development. The data were processed by scientific methods such as analysis, synthesis, comparison and economic analysis in order to obtain relevant results. The graphic processing of results was performed using Microsoft Office Excel.

Results and discussion

Nowadays, society is extremely focused on developing a network of protected areas and on its sustainable management. Protected areas can be divided into national PAs which are established at national level and internationally recognized PAs which are set out in the framework of international and regional agreements, conventions or programs. The most frequently used classification includes the categories of the International Union of Conservation of Nature (IUCN), but at regional or continental level appear new and more flexible frameworks (e.g. pan-European networks Natura 2000 or Emerald).
According to the World Database on Protected Area, about 209,429 PAs from more than 193 countries and territories cover around 15.4 % of the world's land and 3.4% of the global ocean extent (Juffe-Bignoli et al. 2014). The world's protected areas have an extent of 32,868,673 km^2. Around 65% of protected sites are located in the European region, but the protected European surface covers only 12.9% of the total world protected space (Deguignet et al. 2014).
Fig. 1 shows the proportion of sites and area protected in the world. The global expansion of PAs shows not only the current state of environmental conservation but also reveals the touristic potential of PAs, considering that eight billion tourists visit PAs every year (Balmford et al. 2015).
For analysis there were selected two countries with different economic and political development – the Czech Republic and Romania.
Tab. 1 shows the main socioeconomic characteristics of selected countries.
Both are former communist countries but the European Union integration lead to significant improvements in the quality of the environment. In both countries, the nature conservation is focused mainly on large-scale PAs with high forest cover: national parks and protected landscape area (PLA) in the CR, national parks and natural parks in Romania. But their protection network include small-scale PAs too, such as nature reserve or national and natural monuments. The total area under protection in the CR is 1.28 million hectares (16.2% of the territory) and in Romania 5.57 million hectares (23.4%).
In Czech Republic forest ecosystems occupy most of the territory of PAs: 753.4 thousand ha, which represents 28.2 % of the area of national forests. Protection of PAs is carried out by Act no. 114/1992 Coll., on the Nature and Landscape Protection. Forest management in addition to this Act is governed by management plan and Act no. 289/1995 Coll., Forest Code. The nature and landscape protection in large-scale protected areas is supervised by the government and the central authority is the Ministry of the Environment.
In Romania, the large-scale protected areas consist in national parks and natural parks. The main environmental regulations are the Environmental Protection Law (137/1995), the Law of the territory planning (5/2000) and the Forest Code (46/2008) with all the amendments. The central authority in nature conversation is the Ministry of Environment, Water and Forests.
Tab. 2 shows the main characteristics of large-scale protected areas in the CR and Romania.
In the CR, there are 4 national parks: Šumava National Park (SNP), Krkonoše Mountains National Park (KRNAP), Podyjí National Park (PNP) and Bohemian Switzerland National Park (BSNP) and 25 protected landscape areas. Each national park and PLA is managed by its own administration. These non-profit organisations are supervised by the Agency for Nature Conservation and Landscape of the Czech Republic (ANCLP). In the CR, the state budget represents the main source of funding administrations of large-scale protected areas, but there are additional sources such as European Community, the State Environmental Fund, regional administrations, donations or other sources.
Tab. 3 shows the most important socioeconomic information about the National Park Administrations in the CR. The report reveals that most of the costs are related to staff payment and forest management services. One key indicator is represented by the ratio between PA area and the number of employees which is around 150 ha/employee (excepting the largest park, Šumava NP, which has a ratio that exceeds 250 ha/employee).
Tab. 4 displays the most important socioeconomic information about the protected area in Romania. Most national and natural parks from Romania have large areas, nearly half of them exceeding 50 thousand ha. But the funding of PAs is quite low, considering that the majority of PAs are placed

below 10 euro per ha. The largest PAs are more disadvantaged because the larger the PAs are the lower the funds are available per hectare. The underfunding forces PAs administrations to limit the number of staff. There are higher ratios between PA area and the number of employees (the average is above 3000 ha/employee) compared to the situation from the CR. Romania still struggles to find a solution for funding PAs administrations and till now there have been no funds allocated from the state budget (excepting the Danube Delta). Most of the PAs are currently managed by the National Forest Administration, NGOs and county councils. Further, the rapid growth of PAs due to addition of Natura 2000 sites led to confusion regarding the protection status and increased the financial pressure. In Romania Natura 2000 sites cover 23.4% of the territory, compared to only 4.6% of national and natural parks (7.0% including the Danube Delta), but there is a 96.19% overlap with other PAs. Recent studies (Iojă et al. 2010) reveal the declining efficiency of Romanian PAs after the creation of the Natura 2000 network. This decrease is amplified by additional environmental issues, such as high disturbance rates, generated by rapid ownership and institutional changes (Knorn et al. 2012). The revival of PAs is possible only solving the funding problem, and solutions can be found by assessing the economic value of such areas (Dumitraş et al. 2011). According to WWF, Romania groups 65% of the European (without Russia) virgin forests and has the largest European populations of large carnivores. This fact reveals a great potential for tourism and recreation activities, which could partially solve some PAs funding issues.

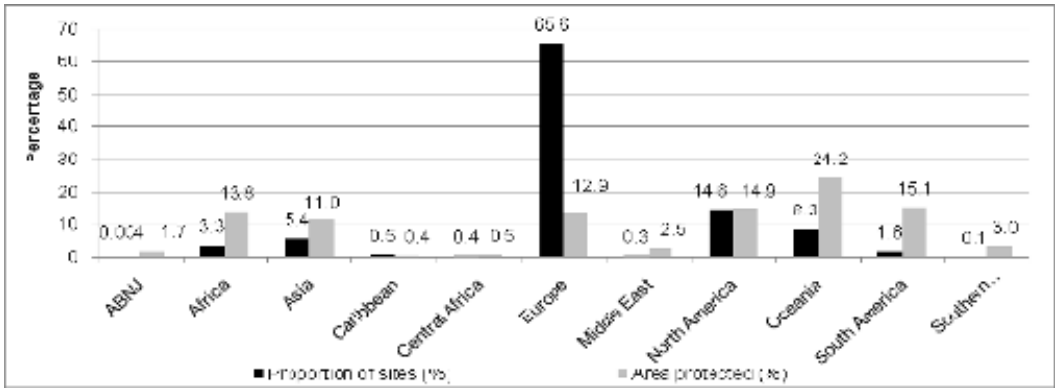

Fig. 1: Percentage of the protected areas' network among global regions
Note: ABNJ – Area beyond national jurisdiction, Source: Deguignet et al. 2014

Tab. 1: The socioeconomic characteristic of the Czech Republic and Romania

Item	Unit	Czech Republic	Romania
Geographic size (2012)	km^2	78,866	238,391
Population (2012)	number	10,505,445	20,095,996
Population as % of total EU population	%	2.1	4.0
Gross domestic product (2012)	billion €	152.926	131.579
EU member country since	year	2004	2007
Political system		parliamentary republic	semi-presidential republic
Currency		Czech koruna (CZK)	Romanian Leu (RON)
Schengen area member	Yes/No	Yes	No
Forest cover	%	34	27
Total area under protection	ha	1,278,685	5,573,265
Percentage share of PA on total area	%	16.18	23.38

Source: European Union 2015; DRNC 2015; Romanian Annual Statistical Report 2013

Tab. 2: The main characteristic of large-scale protected areas in selected countries

Item	Czech Republic		Romania	
	National parks	Protected landscape areas	National parks	Natural parks
Number of areas	4	25	13	15
Total area (thous. ha)	119.5	1,086.7	316.9	772.8
% of country area	1.51	13.77	1.33	3.24
Forest land (thous. ha)	104.5	588.5	247.2	517.8
Forest cover (%)	87.7	54.2	78	67

Source: Ministry of Agriculture 2014; Romanian Annual Statistical Report 2013

Tab. 3: Selected information of the Czech National Park Administrations (2012)

Item	Units	Šumava NP	KRNAP	Podyjí NP	BSNP
NP area without buffer zone	ha	68,064	36,327	6,276	7,933
Area of forest land	ha	59,853	31,779	5,285	7,621
Forest cover (%)	%	87.9	87.5	84.2	96.1
Assets	thous. €	116,435.24	101,724.73	14,648.73	18,406.50
	€/ha	1,710.67	2,800.25	2,334.09	2,320.24
Expenditures	thous. €	17,246.74	13,625.98	1,918.33	4,002.42
	€/ha	253.39	375.09	305.66	504.53
Revenues	thous. €	17,224.80	14,881.09	2,045.44	1,228.84
	€/ha	253.07	409.64	325.91	154.90
Income from transfers	thous. €	9,326.43	7,164.72	1,501.67	-
	€/ha	137.02	197.23	239.27	-
Profit/loss	thous. €	-21.94	1,255.11	127.11	-2,773.59
	€/ha	-0.32	34.55	20.25	-349.63
Staff costs	thous. €	4,659.14	3,899.84	675.58	764.03
	€/ha	68.45	107.35	107.64	96.31
Other services	thous. €	4,877.35	4,338.61	516.73	2,374.05
	€/ha	71.66	119.43	82.33	299.26
Number of employees	number	267	245	44	48
	ha/employee	254.92	148.27	142.64	165.27

Source: Ministry of Agriculture 2014; Ministry of Finance 2015

Conclusion

The large-scale PAs have a great potential for tourism and recreation activities in both of the selected countries and such activities can support PAs development. A responsible environmental management of tourism can produce consistent income for PAs and the recreation activities can raise the awareness of environmental problems. Surely, limits and regulatory measures should be applied in order to compensate some negative impacts on PAs.

The results show that despite the different economic and political development, the nature conservation is built on the same principles in both selected countries. Obviously there are some differences too: the Czech Republic exhibits a more solid funding framework and PAs are better covered with personnel, while Romania has a larger percentage covered with PAs but it faces major funding issues.

Tab. 4: Selected information of the Romanian National and Natural Parks (2010)

Protected Area	Area [ha]	Funds [euro/ha]	Area/employee ratio [ha]
Muntii Macinului National Park	67,363	11.04	2,907
Buila Vânturarita National Park	4,186	48.52	261
Cheile Bicazului-Hasmas National Park	7,976	32.88	665
Ceahlau National Park	8,396	37.08	446
Gradistea Muncelului-Cioclovina Natural Park	40,009	6.8	5,001
Balta Mica a Brailei Natural Park	20,461	19.68	1,461
Vânatori-Neamt Natural Park	30,818	20,74	3,082
Piatra Craiului National Park	17,937	16.77	897
Muntii Calimani National Park	137,446	3.37	7,636
Lunca Muresului Natural Park	17,697	16.63	2,950
Defileul Jiului National Park	11,127	15.44	742
Retezat National Park	43,316	12.53	902
Cozia National Park	17299	12.57	2,472
Danube Delta Biosphere Reserve	660,081	7.85	2,201
Muntii Bucegi Natural Park	238,745	7.18	1,761
Cheile Nerei-Beusnita National Park	37,100	7.7	1,124
Comana Natural Park	25,338	7.5	5,068
Semenic-Cheile Carasului National Park	36,664	7.3	1,111
Domogled-Valea Cernei National Park	60,100	6.86	2,146
Putna-Vrancea Natural Park	38,204	6.53	4,776
Muntii Rodnei National Park	46,399	5.81	967
Muntii Apuseni Natural Park	96,282	4.27	8,204
Muntii Maramuresului Natural Park	148,850	2.84	12,404
Portile de Fier Natural Park	128,765	2.33	8,584
Average values	80,856.63	13.34	3,240.33

Source: Iojă, et al. 2010

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Souhrn
Příspěvek zkoumá rozdíly v ochraně přírody a krajiny v České republice a Rumunsku z pohledu socioekonomického. Management chráněných území čelí v současné době novému paradigma, které vnímá ochranu přírody jako nástroj, který by mohl přispívat k místnímu, případně regionálnímu rozvoji. V České republice je chráněno více než 1,28 mil. hektarů (což představuje 16,2 % z celkové rozlohy území) v Rumunsku je pod ochranou 5,57 mil. hektarů (23,4 % z celkové rozlohy státu). V obou sledovaných zemích se ochrana přírody a krajiny zaměřuje především na velkoplošná chráněná území s vysokým procentem lesnatosti, které představují velký potenciál pro cestovní ruch a rekreační aktivity. Výsledky ukazují podobnosti týkající se zásad a principů, kterými se řídí úsilí v ochraně přírody a krajiny obou zemích a také poukazují na některé rozdíly v oblasti managementu, správy a financování chráněných území.

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ECOLOGICAL EDUCATION IN THE PROMOTIONAL FOREST COMPLEXES

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Abstract
Within the countries belonging to the European Union an ecological education program is realized. This program aims, among others, to raise environmental awareness and change attitudes and behavior of the society, including children and adolescents. In 1994 the first seven Polish Promotional Forest Complexes (PFC) were appointed, mainly to promote multifunctional forest management, but they also had ecological, educational and social significance. Poland currently has 25 PFCs with a total area of 1.207 million hectares. In 2013 5292 outdoor workshops were conducted in PFCs, and they were attended by 185,077 people, other organized events included: 3878 classes in dedicated spaces (124,995 participants), 107 exhibitions, 332 contests and 582 educational actions.

Key words: forest education, forestry education centers

Introduction

In 1972, participants of the United Nations Conference on the Human Environment held in Stockholm, Sweden, emphasised the necessity to develop a global programme of environmental education for the society. Three years later, at the conference in Belgrade, a global framework for environmental education – the Belgrade Charter developed jointly by UNESCO and UNEP – was adopted. The Charter contains the objectives of environmental education and points to the need to incorporate this education into all educational systems. The environmental education issues were also discussed at subsequent international conferences. The Tbilisi Declaration of 1977 put the authorities of member states of UNESCO under the obligation to include in their educational policy both formal and non-formal environmental education programmes and to secure funds necessary for the implementation of this objective. In addition, the declaration recommended the implementation of environmental education in all age and social groups. At the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, the role of environmental education in the promotion of sustainable development was strongly emphasised, whereas the UNESCO Conference held in Athens in 1995 was entirely dedicated to the issue of environmental education for sustainable development. In December 2002, the United Nations General Assembly declared the years 2005-2014 the United Nations Decade of Education for Sustainable Development.

Environmental education in forest areas in Poland

In Poland the obligation to provide the so-called non-formal environmental education is imposed by, among other things, the Nature Conservation Act, the Environmental Protection Law and the Act on Forests, as well as by other ministry documents. For example, in the "State Ecological Policy" of 1991, environmental education was listed as one of the tools used to achieve environmental objectives, and a similar document published in 2000 points additionally to the need to further intensify the actions resulting from the "National Strategy for Environmental Education" and its implementing programme.
The National Strategy for Environmental Education identifies and sets out main objectives of environmental education, presenting at the same time the possibilities of their implementation. The Strategy basically recommends that environmental education should extend to the entire society, all age groups and professionals, as well as decision makers at central and local levels. In addition, the Strategy puts forward the objectives of the education for sustainable development:
1. raising full awareness and increasing public interest in the interrelated economic, social, political and environmental issues;
2. enabling each man to acquire the knowledge and skills necessary for the improvement of the environment condition;
3. creating new behavioral patterns, shaping attitudes, values and beliefs of individuals and social groups taking into account the concern for the quality of the environment.
The accomplishment of these objectives requires among other things:
1. acknowledgment that environmental education is one of the essential conditions for the implementation of the State Ecological Policy;
2. the introduction of elements of environmental education in all areas of social life.

As of 2013, forests in Poland occupied slightly above 9.1 million ha (GUS [Central Statistical Office] 2014), which accounts for 29.4% of the country area. A substantial part of the country's forests – more than 81% – is owned by the public authorities, of which 7,410,000 ha is the property of the State Treasury, whereas 84,000 ha is owned by administrative districts, for instance: Urban Forests of Warsaw, Łódź, Szczecin or Olsztyn. State Forests comprise forests administered by the State Forests National Forest Holding (7,085,000 ha) and forests located in national parks (185,000 ha). Over 18% of the forest area is privately owned.

Pursuant to the Act on Forests of 28 September 1991, forests constituting the State Treasury property are available to the public. They are therefore the place of rest creating opportunities for the implementation of various forms of tourism and recreation. Inappropriate use of forest resources may cause damage or devastation of these lands. Thus, in order to broaden the public knowledge of forests and ways of using them, the State Forest Policy adopted in 1997 acknowledged that the overriding objective of the State Forests National Forest Holding (the State Forests NFH) is education of the public in the field of forestry, with the specific goals including:

- propagation of knowledge of the forest environment as well as of multifunctional and sustainable forestry management;
- increasing public awareness in the field of rational and responsible use of all functions of forests;
- building public trust for the professional activity of foresters.

Forest education carried out by the State Forests NFH refers to the provisions of the Strategy for Environmental Education and has been carried out in various forms and for different age groups. In 2013, over two million people benefited from the educational offer of the State Forests. The most numerous group were children aged 3-6 (more than 36% of all organised recipients of environmental education), and the second largest group comprised people over 19 years of age (almost 24% of all participants). The most popular forms of forest education include educational campaigns and events, such as cleaning up forests or the Forget-me-not's Day, attended by 27% of all participants of the education process. Outdoor activities with foresters were also attended by almost 27% of all participants in environmental education (549,417 people).

In 2002, the Director-General of the State Forests NFH appointed a Task Force to deal with forest education which developed "Guidelines for the development of forest education in the State Forests" as well as "Guidelines for the creation of public forest education programme in Forest Districts". In addition, Regulation No 57/2003 issued by the Director-General of the State Forests NFH orders to assign tasks to be carried out in respect of forest education to a selected staff of each Forest District. As indicated in the "Report on the educational activities of the State Forests NFH in 2013", the roles of the educators were most frequently assigned to Sub-District Forest Managers and Junior Forest Managers.

Role and importance of Promotional Forest Complexes

Promotional Forest Complexes (PFCs) were created in order to secure sustainable conservation and regeneration of the natural assets within the State Forests. Their key objective is to promote multifunctional forest management as part of sustainable development and to serve as functional areas of ecological, educational and social importance (the Act on Forests). Promotional Forest Complexes are located in all Regional Directorates of the State Forests, covering in total 72 Forest Districts (16.7% of all Forest Districts in Poland), and their total area amounts to 1,267,803 ha, which accounts for 13.9% of the total area of the State Forests. One PFC may comprise one to seven Forest Districts, as well as the premises of scientific institutions and universities. The smallest complex, the Niepołomicka Primeval Forest PFC created in 2011, with the area of 11,000 ha covers one Forest District, while the largest one (137,273 ha) is the Notecka Primeval Forest PFC established in 2004 and comprising seven Forest Districts. The first seven Promotional Forest Complexes were established as early as in 1994, whereas the most recent six PFCs were created in 2011. By the end of 2014, twenty five Promotional Forest Complexes were established. What is important for the educational activities of the complexes is the aforementioned regulation of the Director-General, according to which in every Forest District included in the PFC at least one person must be employed as a specialist or senior specialist in forest education.

Promotional Forest Complexes have a well-organised educational base. More than 45% of all forest education centres are located in the Forest Districts included in the PFC (Table 1). About 22% of all exhibition rooms and educational trails are located within the PFCs. A significant number (28%) of the so called small-scale water retention objects used in nature education is also present in the area of promotional complexes. The number of nurseries (14.7%), cultural sites (18.8%) and green classes (19.5%) is less than 20% in comparison with facilities in the area of the State Forests.

Tab. 1: Facilities of the State Forests (SF) used in forest education of the society
(Source: Report on the Educational Activity of the State Forests NFH in 2013)

	Objects	Total in SF	In the area PFC	Share% objectsPFC
1.	Education centers	59	27	45,8
2.	Education room	263	58	22,1
3.	Green classes	532	104	19,5
4.	Educational trials	981	213	21,7
5.	Point of forest education	1 937 in it	386 in it	19,9
5a.	Forest tree nursery	381	56	14,7
5b.	Tree stand	690	133	19,3
5c.	Small-scale water retention	341	97	28,4
6.	Other objects	2504 in it	405 in it	16,2
6a.	Nature reserves	683	139	20,4
6b.	Gardens, parks dendrologic	113	28	24,8
6c.	Cultural sities	421	79	18,8

Outdoor lessons (Table 2) are one of the most popular form of education carried out in promotional complexes, as well as in other units of the State Forests. Over 37% of all activities of this type in 2013 were carried out in the PFCs. It is worth noting however that, on average, one Forest District in the State Forests organises 33 lessons per year, while a Forest District in a PFC provides annually 74 such lessons. Outdoor activities are carried out in the natural and cultural environment, most frequently on educational trails, but also in forest nurseries, natural reserves, seed stands and exhibition rooms. Outdoor lessons may last 1-2 lesson periods, several hours or several days. Lessons lasting several days are mostly interdisciplinary and combine knowledge of nature, history, geography, etc. Another important form of education are meetings with foresters in school classes. They may touch upon different subjects, such as the forester's work, the protection of forest environment, forest resources management etc. Similar meetings take place also during festivities, cultural events or gatherings of various social groups.
Another popular form of nature education are classes conducted in educational centres and exhibition rooms. More than 50% of such activities are organised in exhibition rooms and educational centers within Promotional Forest Complexes. On average, every Forest District of the State Forests holds 22 lessons, while a Forest District belonging to a PFC gives 46 such lessons per year.
Children and young people eagerly take part in competitions (artistic, photographic, literary or knowledge contests) and campaigns organised by the State Forests at various levels: local, regional or national. These events are related to the direct actions taken up in forests and for the benefit of forests, such as forest cleaning, animal feeding during the winter or planting forests. In 2013, the PFCs organised 332 competitions of various kind (25% of all competitions organised by the State Forests) in which more than 10 thousand persons took part.
Individual Promotional Forest Complexes demonstrate a diversity of the quantitative status of the educational infrastructure. Also the number and type of the forms of nature education varies, not just for individual PFCs but also within a single complex in various periods of its activity. Sample data on the educational infrastructure and educational activities that were carried out, are based on three selected Promotional Forest Complexes of a similar area: the Gostynińsko-Włocławskie Forests PFC, established in 1994, with the area of 53,093 acres comprising three Forest Districts, the Rychtalskie Forests PFC, created in 1996 and taking up 47,992 ha comprising two Forest Districts, and the Oliwsko-Darżlubskie Forests PFC, established in 1996 with the area of 40,743 ha comprising two Forest Districts.

In each of the analysed PFCs there is an environmental education centre (Table 3). The Oliwsko-Darżlubskie Forests PFC has even two such centres at its disposal, however there are no educational shelters, and the exhibition room was open only for a short period. A gradual closedown of educational shelters in the Gostynińsko-Włocławskie Forests PFC is also noticeable, while the Rychtalskie Forests PFC increase the number of such facilities in their area. The Gostynińsko-Włocławskie Forests PFC has the largest number of educational trails (8).

Tab. 2: Forest education forms carried out by the State Forests.
(Source: Own study based on the Report on the Educational Activity of the State Forests NFH in 2013)

Form of education	The number of classes in the SF	The number of classes in the PFC	The number of participants	The number of participants in the PFC
outside lesson	14153	5292	549417	185077
lesson in educational room	7638	3878	255988	124995
the meeting with the forester at school	5434	1434	240323	53783
meeting with forester out of school	1612	449	84426	28227
competition	1322	332	108262	35260
educational effort	2398	582	558091	263328
exhibition	864	107	252107	117948
Total	33421	12074	2048614	808618

Tab. 3: Educational infrastructure in the selected PFCs.
(Source: Own study based on the Report on the Educational Activity of the State Forests NFH in 2013)

Promotional Forest Complexes	year	education centers	education room	green classes	educational trials
Gostynińsko - Włocławskie Forest	2006	0	2	2	7
	2008	0	2	4	7
	2010	0	2	4	6
	2013	1	2	1	8
Rychtalskie Forests	2006	0	2	1	3
	2008	1	2	1	3
	2010	1	2	2	4
	2013	1	1	5	3
Oliwsko - Darżlubskie Forests	2006	2	0	0	6
	2008	2	1	0	6
	2010	2	1	0	5
	2013	2	0	0	5

The Gostynińsko-Włocławskie Forests PFC organises a larger number of competitions and events of various type in comparison with the remaining PFCs presented; annually it is 10-17 competitions and 19-61 events, while in the Rychtalskie Forests PFC: 2-9 and 3-6 respectively (Table 4). The Rychtalskie Forests PFC hosts virtually no exhibitions, whereas the Oliwsko-Darżlubskie Forests PFC organises up to 5 exhibitions a year, with more than 5,500 participants. The number of outdoor activities or lessons carried out in exhibition rooms varies depending on the PFC. The Gostynińsko-Włocławskie Forests PFC organises approximately 60 outdoor lessons per year, and the number of lessons conducted in the exhibition room is variable: 40 lessons in 2006 and 2010, and as many as 274 lessons in 2013. In the Rychtalskie Forests PFC there were 81 outdoor lessons and 68 exhibition room lessons in 2006, in 2008 – 126 outdoor lessons but only 46 lessons in the exhibition room, while in 2013 there were as many as 173 outdoor lessons and 101 exhibition room lessons. In the Oliwsko-Darżlubskie Forests PFC only 51 outdoor lessons and as many as 137 exhibition room lessons were

carried out in 2008, however in 2013 there were nearly 160 outdoor lessons and only 34 exhibition room classes.

Tab. 4: Forms of educational activities carried out in the area of the selected PFCs
(Source: Own study based on the Report on the Educational Activity of the State Forests NFH in 2006, 2008, 2010 and 2013)

Promotional Forest Complexes	year	outside lesson		lesson in educational room		competition		educational effort		exhibition	
		number	all comers	number	all comers	number	all comers	number	all comers	number	all comers
Gostynińsko - Włocławskie Forests	2006	103	4477	41	1563	10	1526	35	5539	1	800
	2008	61	2011	175	5334	15	3600	21	2824	1	3500
	2010	61	1926	46	1176	17	4921	61	16293	0	0
	2013	66	3043	274	16004	11	4018	19	2722	1	200
Rychtalskie Forests	2006	81	5421	68	4974	5	380	4	2150	0	0
	2008	126	5154	46	1625	2	70	6	615	1	30
	2010	100	6748	80	2037	3	363	3	348	0	0
	2013	173	16344	101	5275	9	785	4	2360	0	0
Oliwsko - Darżlubskie Forests	2006	102	4752	144	4404	10	1500	3	200	5	5700
	2008	51	1674	137	2798	6	378	9	1835	4	4500
	2010	119	5163	113	3618	11	280	11	2490	2	600
	2013	159	5014	34	1088	4	478	5	7406	1	1250

Conclusion:

1. The Promotional Forest Complexes implement the objectives of the National Strategy for Environmental Education, i.e. non-formal education for different age groups conducted in various forms.
2. The PFCs show a more numerous educational infrastructure base in relation to the State Forests units not included in the PFCs.
3. The PFCs carry out more educational activities in various forms than the State Forests units not included in the PFCs. One of the reasons for this is the possibility of hiring a specialist in education.
4. Both numbers and forms of educational activities carried out are subject to changes in individual PFCs, but also in different periods of operation within a single Promotional Forest Complex.

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Souhrn
V zemích Evropské unie je realizován ekologický vzdělávací program. Cílem tohoto programu je, mimo jiné zvýšit povědomí o životním prostředí a změnit postoje a chování celé společnosti včetně dětí a dospívajících. V Polsku roku 1994 byl založen program Propagace lesních komplexů (PLK), který byl určen zejména na podporu multifunkčního hospodaření v lesích, ale měl i ekologický, vzdělávací a sociální význam. Polsko má v současné době 25 PLK s celkovou rozlohou 1,207 milionů ha. V roce 2013 v rámci PLK proběhlo 5292 venkovních seminářů, kterých se účastnilo celkem 185,077 lidí. Jako další akce lze zmínit 3878 lekcí probíhajících ve vyhrazených prostorách (124,995 účastníků), 107 výstav, 332 soutěží a 582 vzdělávacích akcí.

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ECOSYSTEM RECREATIONAL SERVICES OF A CULTURAL FOREST - CASE STUDY FROM THE VELKÝ KOSÍŘ NATURE PARK, CZECH REPUBLIC

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Abstract
Ecosystem services have an obvious economic value and analogously, ecosystems and biodiversity have their economic value. This is also true for the ecosystem services of forests. The paper demonstrates a simple method for the direct financial assessment of the recreational ecosystem services of a cultural (commercial) forest in a case study of the Velký Kosíř Nature Park (Czech Republic). The result of the study showed that the value of the recreational ecosystem functions of the area under study reached the sum of almost half a million Czech crowns in a single day. Although it is not possible to reach a general conclusion about the monetary value of the recreational ecosystem functions of a commercial forest, on the other hand, the simple method that was used provides a good picture of the relatively high value of the recreational service of a forest ecosystem that primarily fulfils a supplying ecosystem function. The study could also be used as a methodological guide for the simple assessment of an important ecosystem service of a cultural forest, i.e. recreation.

Key words: ecosystem services, cultural forest, assessment, nature park.

Introduction

The Millennium Ecosystem Assessment (MA, 2005) introduced the term ecosystem services (ES), which has already spread not only within the professional literature, but also into widely published texts, including political documents of the European Union. Ecosystem services have an obvious economic value, and therefore ecosystems and biodiversity obviously have an economic value as well. Payments for Ecosystem Services (PES) are being applied increasingly in many countries (Ferraro, 2011).

PES have a particular importance in the case of forest ecosystem services. Forests provide people with ecosystem services from all four major categories of services: (1) supplying ecosystem services (e.g. wood production), (2) regulatory services (e.g. climate regulation or regulation of the consequences of extreme meteorological situations), (3) support services (biodiversity protection), and (4) cultural ecosystem services (e.g. recreational functions of a forest in the landscape).

The recreational functions of a forest include the synthetic effects of the hygiene, health, medical, aesthetic, and psycho-emotional impacts of the forest on the regeneration of the physical and mental capacities of a person. The recreational functions are also performed by forests which are classified as commercial forests (and therefore primarily provide supplying ecosystem services). In the Czech Republic, people can usually enjoy the recreational functions of a forest free of charge, but their valuation is a topical problem.

This paper presents an example of the simple valuation of the ecosystem recreational functions of a commercial forest through the example of cultural forests in the Velký Kosíř Nature Park in the Olomouc region.

Study area and methods

Geomorphologically, the Velký Kosíř Nature Park (Fig. 1) is at the southernmost tip of the Zábřeh highlands. The Nature Park, with an area of 19.6 km², was established in 2000 with the objective of preserving the typical landscape with its natural, aesthetic, and biological values. The vast majority of the area of the Nature Park is covered by commercial forests (mostly spruce monocultures). Only the south-western slopes of the Velký Kosíř hill are covered with xerophilic oak woods with the character of a former coppice. The biodiversity of the forests in the Nature Park is rich. In 1992-2003, 106 kinds of birds were observed in the Nature Park (Stříteský & Krist, 2004). At 442 m above sea level, Velký Kosíř is the highest peak of the Haná region (Machar, 2014). In 2013, a lookout tower (Fig. 2) was erected at the top of the hill and has become the natural centre of a network of hiking trails in the Nature Park. The tradition of so-called New Year's Day climbs began spontaneously in the 1990s. Every first calendar day of the year, people climb to the top of Velký Kosíř along various marked trails

for hikers. These New Year's Day climbs are organised by the hiking club from Lutín and this event became the basis for this study.
The method applied for the assessment of the recreational ecosystem function of a commercial forest is based on a method of direct detection of the willingness of people to pay for ecosystem services (Seják et al., 2010). The research was conducted on 1st January 2015. The number of visitors coming to the Nature Park is based on the number of plastic medals that are distributed free of charge by the hiking club to every person who arrives on foot at the peak of Velký Kosíř within the New Year's Day climb. The total amount the hikers are willing to spend in one day for the recreational use of the Nature Park was calculated as the aggregate of the following items: (1) the total amount collected for the voluntary entrance fee to the lookout tower and (2) the total amount of money spent by the hikers on refreshments at all (four) refreshment stalls. The cost of transport from their place of residence to the Nature Park was not included.

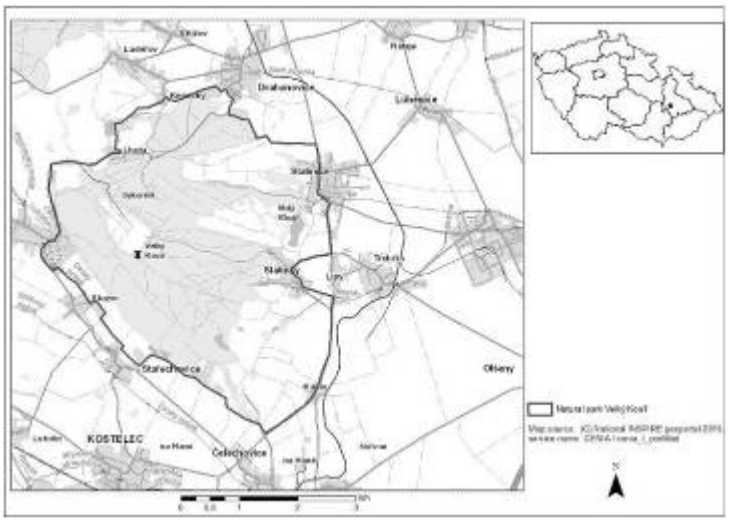

Fig. 1: Study area (Velký Kosíř Nature Park)


Fig. 2: Lookout tower Velký Kosíř (442 m above see level)

Results
The financial assessment of the recreational function of a cultural forest for one day.
In the period concerned, the Velký Kosíř Nature Park was visited by 3256 people. The total sum of payments obtained from voluntary admission to the lookout tower was CZK 98,520.-. The total gross revenue from the sale of refreshments was CZK 379,000.-. The aggregate of both items, amounting to CZK 477,520.-, indicates the direct financial value of the ecosystem recreational function of the cultural forest in the Velký Kosíř Nature Park on the day of the research. It should be noted, however, that the actual number of visitors on the day of a popular event, such as the New Year's Day climb, cannot be automatically generalised.

Discussion and Conclusion

In recent decades, hundreds of studies have been published that focus on the assessment of ecosystem services. The value of these services is usually understood as an incremental (marginal) value, which shows how the value changes when the level or quality of the services is changed. Methodologically, the largest group of assessments to have been carried out is that of experimental methods for the derivation of environmental values from the preferences of individuals (consumers). The preferential methods are further divided into methods focused on deriving values from related markets (especially hedonic methods, travel expenses etc.) and methods for the direct detection of the willingness of people to pay (especially questionnaires based on contingent assessment methods).

The method used in this article does not preclude inaccuracies in the detected primary data. The present study therefore cannot be used to reach a general conclusion about the monetary value of the recreational ecosystem function of a commercial forest. On the other hand, this simple method provides a picture of the relatively high value of the recreational service of a forest ecosystem that primarily fulfils a supplying ecosystem function. The study could also be used as a methodological guide for the simple assessment of an important ecosystem service of a cultural forest, i.e. recreation.

While at its beginnings, the early PES were motivated primarily as tools to suppress certain private interests that were damaging ecosystems, at present it is rather the use of private interests as incentives to achieve socially beneficial goals. PES are understood as a means of protecting the ecosystems outside protected areas or as a component of the international system of payments for carbon sequestration in tropical forests.

Besides the welcome ecosystem services, of course, there are also ecosystem functions that negatively affect the functioning of ecosystems, human civilisation, or both. Some economically dangerous species, known from a human perspective as pests, spread in the agricultural landscape (Zhang et al., 2007). Urban greenery provides people with a wide range of functions that it would be almost impossible to replace. We have known for a long time that the quality of life of city dwellers depends significantly on the presence of sufficiently large and, if possible, healthy green spaces. However, for many inhabitants of human settlements, vegetation is a source of allergies, the most common disease being known incorrectly as hay fever (Lyytimäki & Sipilä, 2009).

The current research trends of the implementation of PES focus on the analysis of the environmental and social impacts of PES. The literature assumes that the application of PES will enhance the provision of ES and will bring advantages to those who live near threatened ecosystems. Unfortunately, we lack reliable data to confirm this theory. There are some important limitations of this theory: as a result of the incorrect administration of programmes and selection of areas, the areas that are contracted are often outside the areas that truly deserve protection, production is moved from the contracted areas in order to obtain payment, and therefore other ecosystems are damaged, the contractors do not observe their obligations as managers, or the contracts are too short to make a fundamental change in the land cover, etc. Above all, there is no assessment of the impacts of the PES that are applied on the environmental and social situation (it is not ascertained what the situation would look like if PES were not applied).

The discussions often lead to the opinion that PES are a kind of a substitute for systems of regulatory protection; actually, the two are complementary, but it is not clear how these two systems influence each other. PES can eliminate socially grounded motivation to protect; on the other hand, they may reduce the opposition that arises against the restrictions caused by the regulatory protection. Therefore, the protected areas and regulatory instruments remain crucial devices in the protection of ecosystems. However, the role of PES has increased recently and they have often become a substitute for, or a complement to, these basic approaches.

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Souhrn
Článek představuje jednoduchý způsob přímého finančního posouzení rekreačně ekosystémových služeb v kulturním (komerčním) lese znázorněnou v případové studii Přírodního parku Velký Kosíř (Česká republika). Výsledky studie ukázaly, že rekreačně ekosystémové funkce zájmového území dosáhly hodnoty zhruba půl milionu českých korun za jediný den. V konkrétních podmínkách kulturního lesa Velký Kosíř dosáhla hodnota rekreačně ekosystémových funkcí 477 520,- Kč za jeden den. I když není možné učinit obecně platný závěr v rámci finanční hodnoty rekreačně ekosystémových funkcí kulturního lesa, na druhé straně tato jednoduchá metoda, která byla použita v našem případě, poskytuje dobrý obraz o relativně vysoké hodnotě rekreace v lesních ekosystémech, které plní primárně funkci ekosystémovou. Studie také může být použita jako metodické vodítko pro jednoduché posuzování důležité ekosystémové funkce kulturního lesa, tj. rekreaci

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ENVIRONMENTAL EDUCATION IN THE FORESTRY ARBORETUMS OF SLOVAKIA

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Abstract
This article deals with the issue of environmental education in forestry arboretums in Slovakia through existing educational trails and their possibility of using for formal and informal education. Accessing of such facilities for the public is linked to mission (the educational and cultural goals) for which they are intended. The natural objects of arboretums are interesting in terms of touristic-educational activities for all ages without difference. Formulation, quantification and creating of conditions for their accessibility are the key issues to achieving of these goals. Slovakia has in the European context attractive natural wealth of forest communities which is predetermined to environmental education with interconnect to movement activities in nature. We mapped in Slovakia the five significant arboretums which were created the foresters and are managed by the forestry institutions. We consider important to inform the public about the particular conditions of access, environmental education and possibilities of various activities in these objects with goal to ensure equal conditions and opportunities for all.

Key words: natural environment, forestry education, educational - touristic trails

Introduction

There are several authors in Slovakia (e.g. Jakubis, Rusko 2003, Jakubis, Jakubisová 2010, 2012, Jakubis 2011, 2013, 2014), who systematically dealt with proposals of trails for environmental education with focus on different goals. Creating of conditions for education and access of public to the trails relate with the description of existing conditions and their quantification. Designing of touristic and educational trails without barriers exists in connection with local traditions, history and natural beauty. Arboretums and other natural objects of similar orientation are appropriate on these purpose.

Materials and methods

In Slovakia are the five of significant arboretums which administer forestry institutions and which have been formed to the demonstration of collections of woody plants with different focus.

Description and character of the objects

1. The Mlyňany Arboretum of the Slovak Academy of Sciences

This object is focused on the collecting of non-native trees and shrubs of Slovakia. On 40 ha of land was founded Evergreen Park in 1892 by Dr. Štefan Ambrózy-Migazzi which he called “Semper Vireo” one of the first large scale plantings of evergreen trees in Central Europe. In dendro-exposure are mainly represented by species of the northern hemisphere wherein dominate tree species of East Asia. Today Mlyňany Arboretum manages a large park, almost 67 ha in extent with a collection of approximately 2000 different trees, mostly varieties of wild species. (http://www.arboretum.sav.sk/).

2. The Arboretum Borová hora of the Technical University in Zvolen

This object is one of the unique facilities with a professional focus on the original dendroflora of Slovakia. Arboretum Borova hora was established in 1965, has almost 50 ha, today. The collection can be divided into three parts: collection of tree species, roses and cacti. With regards to the gene pool, the main attention is aimed on the endangered taxa of the original dendroflora Slovakia, interesting populations of protected and endangered species and on the preservation of various morphological deviations. At present time the collection of tree species in the Arboretum consists of nearly 1800 taxa. (http://www.tuzvo.sk/abh/).

3. The Arboretum Kysihýbel of the National Forest Centre

The arboretum near Banská Štiavnica (town inscribed on the List of World Cultural and Natural Heritage) is the unique experimental forestry area of fast-growing exotic species. It was founded in 1900 an area of 7.73 hectares. In this area was planted 282 pieces of woody from the northern hemisphere, originating mainly from North America. The aim of the foundation of the arboretum was to create opportunities for research of exotic species and their use in forestry. Planting of individual woody plants was carried out on the areas of 15x15 m according to systematic unification of species and forms to the attributable genus
(http://www.nlcsk.sk/nlc_sk/ustavy/lvu/vyskum/olspe/arboretum.aspx).

4. The Arboretum Liptovský Hrádok at the Secondary Forestry School Jozef Dekret Matejovie

Establishment of the arboretum is associated with the establishment of forestry education in Liptovský Hrádok. In the vicinity of the seat of the first forestry school, already in 1796 began to build a decorative English park with an area of about 20 ha. At present, however, has much smaller area more than 7 ha. It is the highest situated arboretum (605 a s.l.) in Central Europe and contains about 720 tree species ((http://lhradok.sk/arboretum-liptovsky-hradok/). Collection is divided into zones according to plantings (see Fig. 1).

5. The Arboretum Ortáše of the Cemjata School Management at the Secondary Forestry School in Prešov

The arboretum is a purpose-built facility of the Cemjata School Management at the Secondary Forestry School in Prešov and is located in the forestry park Cemjata near Prešov. Its total area is of 13.09 ha. The area is divided into 26 separate stands of varying size and shape. Currently contains about 180 different species of trees. Its main mission is to provide space for the practical training of future foresters (http://www.slspo.sk/skolske-hospodarstvo/arboretum/).

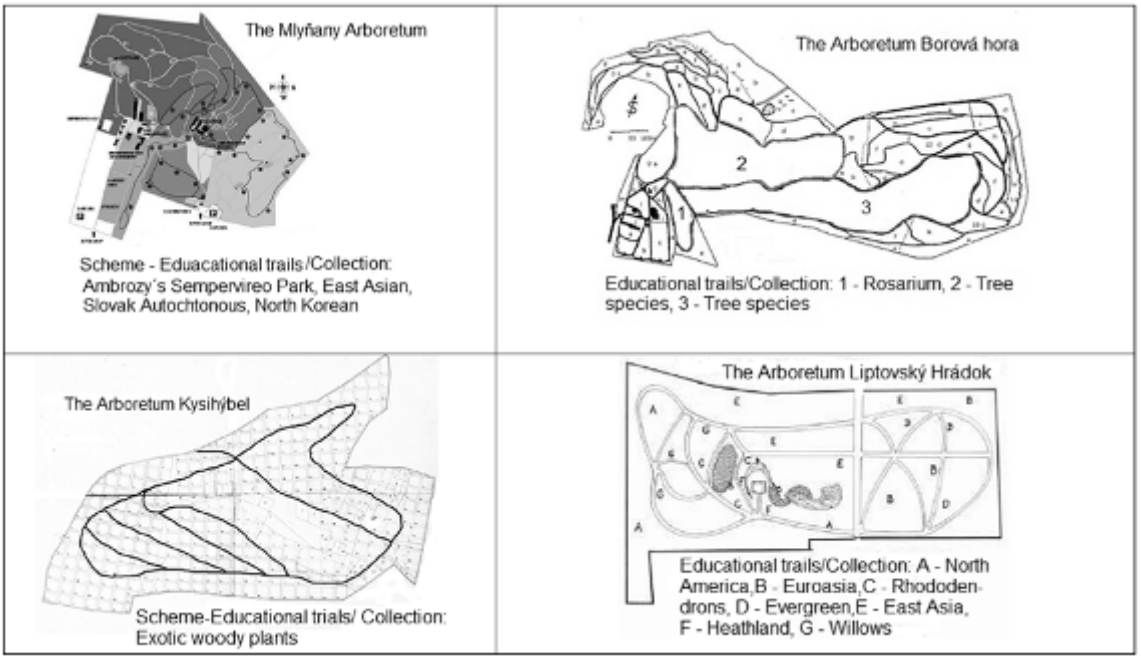

Fig. 1: Educational trails in the arboretums (schemes), Internet sources: http://www.arboretum.sav.sk http://www.tuzvo.sk/abh/, http://www.nlcsk.sk/nlc_sk/ustavy/lvu/vyskum/olspe/arboretum.aspx, http://www.slspo.sk/skolske-hospodarstvo/arboretum/, http://lhradok.sk/arboretum-liptovsky-hradok/

Results

The results, data and schemes about the educational trails are processed in Tab. 1, 2 and Fig. 1. Within detailed evaluation we came to the following results:

• In Slovakia we have the five significant arboretum which were based by institutions with focusing on dendrologic collections (see Tab. 1, 2).

• In all referred arboretums is realized formal and informal environmental education with a diverse range of different activities. The most extensive informal education with regard to the visitors provides arboretum Mlyňany (37,479 / 2014) and Borová hora (8,500/2014). Other arboretums do not report these data (see Tab. 1).

• Historically the oldest are arboretums: Hrádocké (1886), Mlyňany (1892), Kysihýbel (1900). The most significant of these is the Mlyňany (see Tab. 1).

• Historically the youngest are arboretums: Borová hora (1965) a Ortáše (1978). The Arboretum Borová hora belongs to the most important in Slovakia.

• From the perspective of a technical ensure of environmental education through nature trails, have four arboretum very good conditions for its development potential (except the Ortáše).

• The best developed network of environmental educational trails are in the arboretums Mlyňany and Borová hora (see Fig. 1 and Tab. 2).

• The level of informal education activities in the arboretums corresponds with professionalism of educational forestry institutions which is significant at national and international level in the context of the education in Central Europe.

Tab. 1: The Forestry Arboretums of Slovakia, basic informations

Data / Arboretum	Mlyňany	Borová hora	Kysihýbel	Liptovský Hrádok	Ortáše
Localization / geomorpholo gical unit of the SR	Podunajská pahorkatina	Zvolenská kotlina	Štiavnické vrchy	Podtatranská kotlina	Šarišská vrchovina
Altitudinal range or altitude (m a s.l.)	135 – 217	291 - 377	530 – 563	650	376 - 413
Founded in year	1892	1965	1900	1886	1978
Initially area (ha)	40	28.38	7.78	27.17	13.09
Acreage of the arboretum (ha)/ ranking	72/1^{s}	47.89/2nd	7.78/3th	7.24/4th	13.54/is not included in evaluation
The protected area (PA, ha)	61.15	45.50	7.78	7.24	not PA
Range of collections/ ranking	*1933 of taxa/2nd	*2500 of taxa/1st	*260 of taxa / 4th	**740 of taxa/3th	*180 of taxa/5th
From year /type of protection	1951/PS	1981/PS	1950/PS	1982/PS	-
Level of protection	4th	3rd	3rd	4th	FSP by PCF
Cadastral area	Vieska nad Žitavou, Mlyňany	Hájniky, Zvolen, Rybáre	Banská Štiavnica	Liptovský Hrádok	Prešov
Name of organizational unit which administrates the PA	SNP - PLA Ponitrie	SNP - PLA Poľana	SNP - PLA Štiavnické vrchy	TANAP	Cemjata School Management
Landscape architecture (styl,structure, character)	gardens and natural landscape style	natural landscape style	natural landscape style	botanical park	natural landscape style
Number of visitors on trails/2014	***37 479	8 500	there are no data	there are no data	there are no data
Seasonally available (from - to)	1 Apri l- 25 October, 8:00 to 17:00	15 March -31 October, 7:30 to 15:00	after notification only with a guide	open all year	open all year
Accessibility/ weekends	yes, 8:00 to 18:00	only with a guide	no	yes	yes
Interesting data	2nd the oldest and one of most significant exotic collections in the SR	the biggest collec-tions of native woody plants and roses in the SR	the arboretum (near of Banská Štiavnica, World Natural and Cultural Heritage)	the highest located and oldest of the SR	the individual selection trees with high value

Note: PS - Protected site; FSP – Forest of Special Purpose, PCF - Program of care for forest (2012 – 2021); SNP - State Nature Protection; CHKO- Protected Landscape Area; SR – Slovac Republic; TANAP – Tatra National Park; * - data from 2014; ** - data from 2007
*** - data of Internet sources: (http://uzemia.enviroportal.sk, http://www.arboretum.sav.sk/files/file/zaverecne_spravy/AM2014.pdf)

Tab. 2: Description: Contens of Protection/Educational Trails and the Environmental Education in the arboretums

Object of protection in PA/ The existing of environmental education and educational trails	The Mlyňany Arboretum of the Slovak Academy of Sciences	The protected area is declared for the protection of a garden of local and exotic woody plants (from the Mediterranean, East Asia, Caucasus, Central Asia, North America). The garden was established in 1892 as a private garden by Dr. Štefan Ambrózy-Migazzi for the study of acclimatisation of these species in our climatic conditions. Here is studied the suitability of exotic woody plants for local economic purposes. Presents the gene pool of both local and exotic woody plants.
		1. Educational trail with the Ambrózy´s Semper vireo park - red sign, 10 stations, duration of the route ca 60 minutes 2. Educational trail of the East Asian Dendroflora, green sign, 10 stations, duration of the route ca 50 minutes 3. Educational trail of the North American Dendroflora, green sign, 10 stations, duration of the route ca 40 minutes 4. Educational trail of the North Korean Dendroflora, brown sign, 5 stations, duration of the route ca 30 minutes 5. Educational trail of the Slovak Autochtonous Dendroflora, blue sign, 5 stations, duration of the route ca 30 minutes
	The Arboretum Borová hora of the Technical University in Zvolen	The protected area is declared for the protection of an example of genetic diversity of the woody plants composition of Slovakia and their wide individual variability of the woody plants species, for scientific research and educational purposes. Arboretum is unique facilities of the Technical University in Zvolen with a professional focus on the autochtonous dendroflora of Slovakia. The collections are intended for educational, scientific and research work with accent on forestry dendrology.
		1. Educational trail of the Rosarium, red sign, 2 stations, the duration of the route ca 30 minutes 2. Educational trail of the Slovak Autochtonous Dendroflora, green sign, 16 stations, duration of the route ca 60 minutes 3. Educational trail of the Slovak Autochtonous Dendroflora, blue sign, 17 stations, duration of the route ca 120 minutes
	The Arboretum Kysihýbel of the National Forest Centre	The protected area is declared for the protection of one of the most valuable dendrological objects in Slovakia, important for the scientific research (study of exotic woody plants) and for educational purposes. It was founded by J.Tuzson, an assistant of the Forestry Academy in Banská Štiavnica in 1900.Part of the arboretum is International Phenological Garden with 30 taxa.
		1. Educational trail of the exotic woody plants, 16 stations, length of the route 6.2 km, duration of the route ca 3 hours
	The Arboretum Liptovský Hrádok at the Secondary Forestry School Jozefa Dekreta Matejovie	The Liptovský Hrádok arboretum is an ideal natural study room for teaching of dendrology but also other disciplines at the Secondary Forestry School in Liptovský Hrádok. It makes possible the study of ecological conditions and acclimatisation of exotic woody plants in given conditions. It is important part of the greenery Liptovský Hrádok.
		1. Educational trail, called "The Green heart of Hrádok, 6 stations, duration of the route ca 2 hours. Its main purpose was to create an educational space for the practical education of future foresters.
	The Arboretum Ortáše of the School Management Cemjata at the Secondary Forestry School in Prešov Note:Forests of Special Purpose – not protected area	The forest stands of: European Larch (Larix decidua), Oak "Kokošokský" and "Cemjatský", European Beech (Fagus sylvatica), Scots Pine (Pinus sylvestris), European cherry (Prunus padus), Silver Fir (Abies alba) and the individual selection trees of pine have a high value by reason of the conservation of gene pool. On the territory of the arboretum are protected species: Cordulegaster annulatus, Rana temporaria, Bufo bufo, Nyctalus noctula, Salamandra salamandra, Coronella austriaca, Falco tinnunculus, Corvus corax, Jynx torquilla, Strix uralensis, Dendrocopos leucotos, Dryomys nitedula, Lilium martagon, Platanthera bifolia (species of the names are given in Latin). Its main purpose was to create an educational space for the practical education of future foresters.
		1. Educational trail called "Kvašná voda", 16 stations, length of the route 3.7 km, duration of the route ca 100 minutes. Near the route is complex "Berecína" for disabled people in a wheelchair. It is part of the trail "Zabíjaná" in the famous area "Cemjata".

Conclusion
Importance of the existence of arboretums in terms of preservation of natural and cultural heritage for future generations is in context with creating of responsibility of the current generation. This objective can be achieved according to the creative ways of environmental education and training. In terms of history, content and orientation are the arboretums rich source of information not only for pupils and students of primary, secondary and higher education but also for visitors from general public.

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Souhrn
Článek se zabývá problematikou environmentální výchovy prostřednictvím naučných stezek v lesnických arboretech na Slovensku (Mlyňany, Borová hora, Kysihýbel, Liptovský Hrádok, Ortáše) a možnostech jejich využití pro formální a neformální vzdělávání. Přístup takových zařízení pro veřejnost je spojen s posláním a zaměřením (vzdělávací, výzkumné a kulturní cíle), na které jsou tyto objekty určeny. Přírodní objekty Arboreta jsou zajímavé z hlediska turisticko-vzdělávacích aktivit pro všechny věkové kategorie. Formulace, kvantifikace a vytváření podmínek pro jejich dostupnost jsou klíčové otázky pro dosažení těchto cílů. Slovensko má v evropském kontextu atraktivní přírodní bohatství lesních společenstev, které jsou předurčeny k ekologické výchově. Zmapovali jsme pět významných Arboret Slovenska, na jejichž budování mají podíl lesníci a jsou spravovány lesnickými institucemi. Považujeme za důležité informovat veřejnost o konkrétních podmínkách existence naučných stezek, o možnostech zaměření environmentálního vzdělávání a výchovy v těchto objektech s cílem zajistit stejné podmínky a příležitosti pro všechny.

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ENVIRONMENTAL STRESSORS IN URBAN AREA

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Abstract
The analysis of environmental stressors and its causes is a crucial prerequisite for the development of risk prevention and mitigation measures in the scope of disaster risk management. The growth of cities inevitably leads to a growth in the demand for basic services, facilities and opportunities.
Paper describes an example of the agglomeration area of Kosice, its fundamental characteristics related to its geological and hydrogeological structure, local climate and urbanization of the area. Natural stressors are significant problem in the Kosice city and it includes mainly landslides, soil erosion and floods.
Some examples of the current natural sources of stressors and burdens as well as analytical risk evaluation using graphs and maps are presented. Overall assessment of the area and suggestions of possible measures prior to the occurrence of environmental burdens and stressors are in the conclusion.

Key words: environmental risk, environmental burden, landslide, soil erosion, flood

Introduction

Environmental burden [1] is a site, where hazardous substance caused by human activities, poses a significant risk to human health or to the environment, soil and groundwater, except environmental damage (Directive 2004/35/EC).
Potential environmental burden is a site, where presence of contaminated soil is reasonably expected (potential soil-contaminating activities have taken place in the past).
Basic legal regulations of the Slovak Republic in the field of interest are (Directive, 2004):

- Act No. 409/2011 Coll. on certain measures in relation to environmental burdens and on the amendment of certain acts (the Act entered into force on January 1st, 2012.)
- Act No. 569/2007 Coll. on geological works (Geological Act), as amended (the Act entered into force on January 1st, 2008.)
- The Regulation of the MoE SR No. 51/2008 Coll. Implementing the Geological Act (the Regulation entered into force on February 15th, 2008.)
- The State Remediation Programme of Environmental Burdens (2010 – 2015) represents the basic strategic document for management of contaminated sites in Slovakia, which determines the tasks to gradually reduce the negative impacts of environmental burdens on human health and the environment.

Study area

Kosice city is situated in the southeast of Slovakia. Kosice lies at an altitude of 206 metres asl. and covers an area of 242.77 km^2. It is located about 20 km from the Hungarian, 80 km from the Ukrainian, and 90 km from the Polish borders. Kosice is situated near the Hornad River in the Kosice Basin. Kosice city with a population of 239 797 (data from 31.12.2013) is administratively divided into four districts. Kosice I. (in the north), Kosice II. (in the west to the south-west), Kosice III. (in the east) and Kosice IV. (in the south and south-east). In the middle of these districts is the city centre. These districts are further divided into 22 boroughs.

- *Geology*

According to the regional geomorphological division of the bulk of the area of the city belongs to the Kosice hollow geomorphological unit. The northern and north-eastern part of the territory extends geomorphological complex Cierna hora and northwest projection falls within the geomorphological unit Volovske vrchy. Geological structure of the territory is largely established by neogene rocks (clays, clay shales, sands, sandstones, conglomerates, tuffs, bentonite and organogenic limestones).
The greatest importance of mineral resources located in the city is magnesite deposit in Bankov locality, also deposit of ceramic clay and stone products. Carpathian breaks and tectonic fractures had a major impact in Kosicka hollow creation. Slope movements also took part in relief basin modelling. In this area, three types of motion are visible: landslides, earth flows and surface crawling. Especially the first and the third type are abundant in the city. Landslides are common in locations Furca, Heringes, Konopiska and surface crawling in the area of Vysne Opatske.

- *Hydrology*

From the hydrological point of view Kosice belongs to the basin of Hornad river and Bodva river (Figure 1). The main watercourse in the city is river Hornad, which runs through the city in the north – south direction. From the right side the river picks up two tributaries - the river Cermel and Myslavsky stream. Water reservoir Bukovec on rivers Hornad and Ida are used as a supply of drinking water for the city. The lake "Jazero" was established after gravel mining (in the southern part of the city) and it is used for recreational purposes, nowadays.

Fig. 1: Rivers in Kosice – district

The average annual flow in the Hornad basin is ranged from 35% -55% of Q_a (long-term average annual flow). The maximum average monthly discharges occur in April and May and minimum monthly flows were measured in February, December and August.

The most important groundwater resources are located in the southern part of the area in the quaternary sediments. Ground water level is mainly at a depth less than 2 m below the surface. In the lower terraces of river Hornad the ground water is at a depth of 2-5 m and in case of high terraces at a depth of 5-10 m below the surface. There is a source of mineral water on the northern outskirts of the city - the former Gajdova spa (still active mineral spring) and in the Sebastovce (Kosice district) source of the geothermal water is registered with capacity of 10 $l.s^{-1}$.

- *Climatology*

Kosice agglomeration is under climate classification in warm territory, where the average number of summer days is 50 and more per year. Temperature is an area with characteristics of temperate continental climate. Temperatures range from 6.7 °C to 10.3 °C in the long-term average, in recent years slight increase in average temperature is monitored. The frequency of strong winds of northern directions is prevailing.

Results and discussion

Among environmental stressors existing in Kosice agglomeration belong the landslides and soil erosion and they are the main cause of environmental loads formation.

- Landslides

Landslides occur in the peripheral parts of the Neo-volcanic mountains with the transition to the Neogene basins. Specific locations of Kosice where the degraded area caused by landslide are Konopiska, Heringes, Krasna nad Hornadom and settlement Dargovskych hrdinov. In the Fig. 2 (Viceš, 2013) susceptibility of Kosice agglomeration and its districts are presented. Landslides areas are divided into 3 states (strong susceptibility, middle susceptibility and low susceptibility).

The State of the Environment of the Slovak Republic for 2011 reported the following landslides (Správa, 2011):

- Kosice – settlement Dargovskych hrdinov - In terms of stability, low amount of precipitation in 2011 may be perceived positively. It led to a downward trend in groundwater levels. The movements of the area will be verified by performing the next phase of measurements,
- Kosice – Krasna nad Hornadom (Fig.3) - The low amount of precipitation recorded in the second half of the year showed a loss of groundwater level in the well KHG-2. Capacity of

drainage wells had steady to slightly increasing character. The movements of the area will be verified by inclinometer measurements in next stage (Viceš, 2013).

Fig. 2: Susceptibility of Kosice to landslides

Fig. 3: Krasna nad Hornadom – landlides

- Soil erosion

Soil erosion has a negative effect on soils in Kosice and its surroundings. Soil erosion is one of the stressors that negatively affect the agricultural land and landscape as a threat by disruption of the natural evolution of soil biota. Especially at the terraced sediments of Hornad and Torysa river slight soil erosion is typical in Kosice basin. Surface erosion caused by water represents the most dangerous form of erosion in the area. It occurs in agricultural soils on slopes where the water in its devastating activity uses also geoenergy of the relief.
In the next table the percentage representation of soil erosion of agricultural land in Kosice four districts and in Kosice surrounding is shown (Pôdny portal).

Tab. 1: Categories of erosion threat in Kosice surroundings

District	Categories of erosion threat %			
	No threat-low erosion	Middle erosion	Strong erosion	Extreme erosion
Kosice I	43.81	31.77	17.75	6.68
Kosice II	4.96	20.93	49.76	24.35
Kosice III	61.65	31.56	6.04	0.75
Kosice IV	-	54.13	38.06	7.81
Kosice - surrounding	78.68	10.16	10.31	0.86

From the Table 1 follows that extreme (almost 25%) and strong erosion (almost 50%) is prevailing mainly in Kosice II. Strong erosion (38%) also exists in Kosice IV. Low and middle erosion was evaluated in Kosice III and in Kosice surrounding.
Soil is threatened by erosion mainly in areas (Program, 2008-2015):

- ✓ In the northern part of the Kosice - Kavecany vicinity, southern slopes of the Hradova and Darius mountain in the north from Tahanovce settlement,
- ✓ In the eastern part risk locations are vicinity of Kosicka Nova Ves, Heringes and its surroundings, slopes oriented on southwest of Sady nad Torysou, the critical area of Bankov mine and its surroundings, Cicky (northwest of KVP settlement) and the area between Lorincik and Polov villages in northeast of Saca.

All these areas mentioned above are clearly visible in Figure 4 (red square is where the studied area is located) (Pôdny portal) .

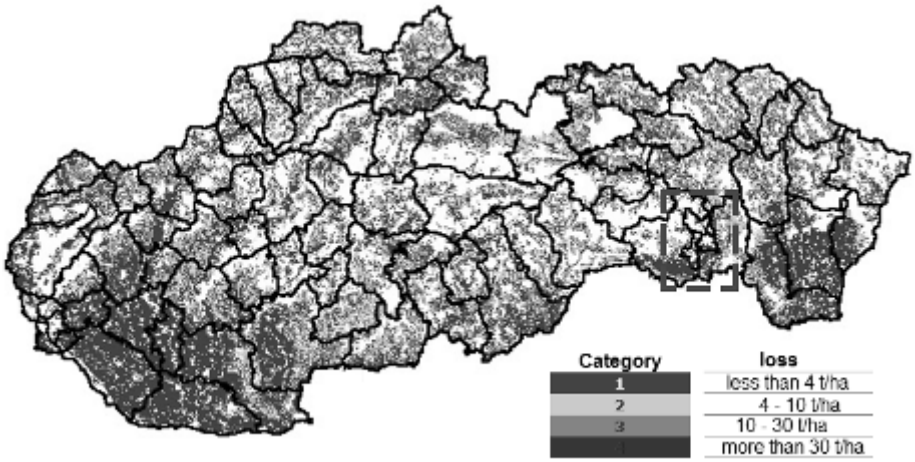

Fig. 4: Categories of soil risk in Slovakia (Kosice district- red square)

- ➢ Floods

The Directive (2007) shall be carried out in coordination with the Water Framework Directive, notably by flood risk management plans and river basin management plans being coordinated, and through coordination of the public participation procedures in the preparation of these plans. All assessments, maps and plans prepared shall be made and available to the public. In 2010 were measured devastating series of weather events which occurred across several Central European countries during May and June. Slovakia, especially eastern parts of Slovakia was the worst affected. A lot of villages were in Kosice – district. The most affected sites in Kosice were settlements Dzungla, Vysne Opatske, Krasna nad Hornadom and Saca. In Figure 5a situation in Tahanovsky Bridge is depicted. In Sady nad Torysou (Košice vicinity) water spilled over the levee and the water hit 40 houses of which had to leave about 70 people.

From the Cana village some families from 3 streets had to be evacuated. Problems with flood are also in municipalities (Kosice district): Trstene, Gynov, Sena achieving the Hungarian border. Roads Cana - Zdana, Nizna Hutka - Nizna Mysla, Kosice - Druzstevna pri Hornade - Trebejov (Fig. 5b) - Kysak - Mala Lodina - Ruzin were closed.

Fig. 5: Floods near Tahanovsky Bridge (a) and Trebejov village (Kosice district) (b)

Also road Zdoba - Byster was closed whereas the levee in Sady nad Torysou was overflowed and the road was flooded.

The third flood degree was also in Kosice region in May 2014. Rivers Hornad, Torysa as well as its small tributaries spill out the river beds and threaten the villages. Local floods threaten also districts Tahanovce, Krasna nad Hornadom, Polov and Saca.

Conclusion

In conclusion it can be said that environmental burdens and risks of Kosice city include particularly significant multiple occurrence of landslides, soil erosion and floods, which are fundamental factors affecting the environment Kosice. Some proposals for environmental condition improvement are:

- Ensuring biodiversity through effective protection of habitats, wildlife and wild plants with emphasis on economic, social and cultural requirements of the city.
- Provide support of environmental projects.
- Improve environmental education (primary and secondary schools) and teaching materials in the field.
- Revitalization of watercourses and drainage of basins.
- Avoidance of erosion negative impact.
- Promoting of energy production with an emphasis on renewable sources.
- Developing a broaden network of monitoring and measuring stations.
- The rational usage of natural resources.

The environment is an important part of our lives and it is therefore essential that we protect it.

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Souhrn

Příspěvek popisuje aglomeraci Košice, její základní charakteristiky, které souvisejí s geologickou a hydrogeologických strukturou a místní klimatem. Kromě stresorů způsobených lidskou činností také přírodní stresory jsou významným problémem ve městě Košice, a ty zahrnují zejména sesuvy půdy, erozi půdy a povodně. Některé příklady současných přírodních zdrojů stresorů jsou prezentovány. Celkové hodnocení území a návrhy možných opatření před vznikem těchto stresorů jsou uvedeny v závěru.

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EVALUATION OF REAL AND POSSIBLE FUNCTIONS AT SELECTED SMALL WATER RESERVOIRS

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Abstract
Small water reservoirs in the past were frequently implemented as a more or less dedicated. After their implementation and for inclusion in the neighborhood often encountered even more options for their use. Today, the "ponds" are proposed mainly as a multipurpose reservoir, or multifunctional. During the construction, renovation or reconstruction of basins, particularly if it is requested support from public funds, we need prefer their public functions, which include: retention of flood flows, increase water quality, improvement of the landscape, biodiversity, and promotion of recreational facilities villages. This paper deals with the use of small water reservoirs implemented or designed in the last few years. On these specific examples, it evaluates the possible potential recreational use or potential conflicts in the use and functionality of the basin. Small water reservoirs are of Act No. 214/1992 Coll. important element of the landscape, their completion can significantly improve the ecological potential of the site. But if the basin will propose already ecologically valuable areas, it may on the contrary to the degradation of the site.

Key words: retention, recreation, water area, littoral, bank

Introduction

The first written mention of the ponds in our country date from the 11th century. At that time, the ponds were constructed multipurpose. The pond was used for primarily for water accumulation and subsequently for the economic purposes of the population as a water supply, fire protection, fish breeding, drainage, etc. Today, these functions are expanded mainly associated with the function it demands for water retention in the landscape that are subject to the applicable legislation of the Czech Republic. The construction or renovation of reservoirs can be, aside from the dominant function to achieve a variety of other positive effects. First of all there always will be to increase water supplies in the landscape with a positive impact on local groundwater reserves. Reservoirs also positively influence the course of high water, upgrade flow below the reservoir during water shortages while increasing the recreational potential of the locality. The Reservoirs perform a biological function; become a habitat for aquatic and wetland plants and animals. Of natural aspect most valuable part of the tank is the littoral zone. To the littoral zone is concentrated in many forms of aquatic life - breeding amphibians, spawning, nesting waterfowl, occurrence and reproduction of small aquatic animals. To the littoral zone is concentrated in many forms of aquatic life - breeding amphibians, spawning, nesting waterfowl, Occurrence and reproduction of aquatic animals small. Each water reservoirs, whether renovation or construction becomes an important landscape feature (according to § 4 of the Act no. 114/1992 Coll., on nature and landscape protection).

Materials and methods

Selected reservoirs are located in different environments and were therefore put on them and different requirements. Water reservoirs are evaluated primarily due to the location and subsequent integration into the surrounding landscape.
Water tank "Časkovec" reservoir is located in an agricultural landscape in the South Moravian region near the village of Velké Hostěrádky. Water tank originally had approximately a rectangular shape with dimensions of 135 x 25 meters and is situated on the left bank of the Hunivka river, near the farmhouse Časkovec; between the flow and buildings. The tank is recessed into the sandy loam flood stream and is fed by a spring fissure in the bottom of the tank and subsidize inflow of groundwater. In 2006, tank was reconstruction. Widening and deepening the tank bottom sediment removal, stabilization of the bottom slope, bank lining and dam reservoir, construction of a new discharge device, creating a wetland ecosystem, vegetational adjustment around the tank.
Selected reservoirs "Above the Arboretum" tanks are realized in the forest complex, site is located on the territory of Training Forest Enterprise Masaryk Forest Křtiny (TFE) northwest of the Křtiny village. Reservoirs localed on the Zemanův Žleb stream, which flows into the Křtinský stream and the basin is 8.143 km^2.

Another example is the small tank castle, which is located on the eastern edge of the cadastre of the city of Brno - Bystrc under the Veveří castle. Small pond Malý hradní was used in the past as fish breeding. Below the dam are hatcheries. According to the Brno city plan area of interest falls within the resort area of Brno dam. The reservoir is fed by the Veverka stream consisting mainly of forests. The purpose of the reconstruction was to restore the operation of the water supply from Veverka stream to the Malý hradní and restore functionality of small reservoir. The completed building will serve as a landscape-protection function biota.

Results

Částkovec reservoir was refurbished in 2006, the project was handled in 2003. In addition to cleaning reservoir - silt removal, edit the shape reservoir, also included a proposal plantings around a proposal wetlands, which significantly diversifies surroundings and create a new wetland habitat for flora and fauna, wetlands is a useful complement to the landscape next to free water surface of the tank. Original regular shape reservoir was replaced so that the tank better fit into the surroundings. Plantations in the proposed project have not been implemented under renovation. In the vicinity of the tank is grassland, land is grazed by cattle. Absence suite vegetation and greatly reduces the overall ecological but also an aesthetic value of the site. On the site allocated for the pools and wetlands, were implemented two pools depths of about 1.8 meters. Plantings around the pools were realized only around the perimeter of the triangular parcel. (see the figure 1)

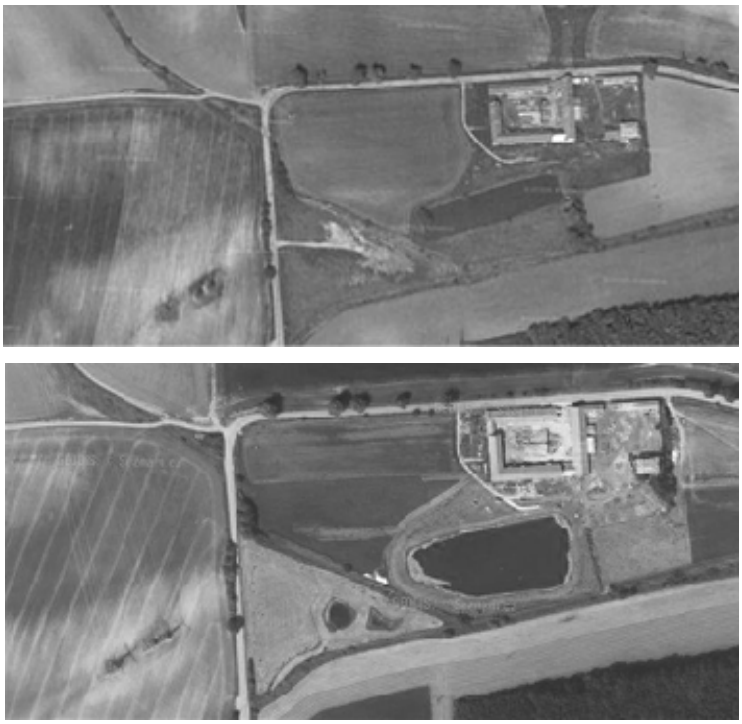

Fig. 1: The Comparison Částkovec reservoirs before and after reconstruction
(www.mapy.cz, edited by the author)

Reservoirs implemented in the TFE were designed in 2004, the implementation was begun in 2007. It is a system of two flow-through tanks homogeneous earth dams. On both associated objects are built for discharge and transfer of high water. Valleys around the reservoirs, a marked hiking trail in the vicinity of the second tank are two wells and there is also, at the crossroads of hiking trails is turist landing. Landscaping around the tank consisted mainly of bank stabilization, treatment and ensuring access to the well springing right on the banks of the cesond reservoir. Planting due to surrounding forest stands have been proposed. The location is frequently visited by tourists and is a target not only from the surrounding villages, but also from nearby Brno. These tanks used as a very successful example of the implementation of small water reservoirs. They are important elements of the landscape and the enrichment of the surrounding woodlands. Though they are not intended as a priority for recreational purposes and swimming are important elements fit into the concept of management and recreational use of the TFE, with an emphasis on ecology and aesthetics. (see the figure 2)

Fig. 2: The Reservoirs "Above the Arboretum" *(photo by author)*

Reconstruction of headrace and restoration reservoir Malý hradní is at the stage of obtaining a building permit. The reconstruction was proposed modification of the dam, new discharge structure - a bottom outlet, total renovation of backwater area proposal littoral and finishes shores. The main part is to design a headworks and the pipe bridge with a supply drive from the Veverka river. One of the main reasons for building the Malý hradní restore function as an important element of the landscape. The overall impact of the building on nature and the landscape will be positive. Created habitat suitable for reproduction amphibians, life of small birds, insects and other animals. The building is located on the territory biocentre Podkomorské lesy and their importance in the sense of belonging to the existence of this biocentre. The building is designed to promote the ecological functions of the landscape. Construction and will be at least partially counterbalance the negative effects of Brno dam on the links in the countryside and landscape features. (see the figure 3)

Fig. 3: The Reservoirs Malý hradní – backwater area *(photo by author)*

Conclucion and discussion
Selected reservoirs described in the article are in different environments, and are placed on them very different requirements. A common feature is that they are always beneficial for increasing biodiversity, aesthetic values and recreational potential of the locality.
The above example Častkovec reservoirs shows that the projected reconstruction reservoirs are often not implemented according to project documentation. The efforts of designers to integrate reservoirs into the landscape and an emphasis on landscape management are wishful thinking. Primarily proposals plantations are not accepted in full accordance with the project documentation. For tanks in the agricultural landscape are banks vegetations very important. Planting and subsequent necessary care, protection against browsing, are indispensable item in the budget. Inconsistent implementation of the reconstruction of the tank can be beneficial, due to the shape adjustment, silt removal and construction of pools. Reservoirs implemented or reconstructed in forest complexes are often spared the design and implementation of vegetation in the area. These tanks have their claims for inclusion into the field and bank stabilization. The above mentioned tanks are very busy recreational areas, although not intended for swimming; emphasis is placed on the appropriate location and also on safety.

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Souhrn
Malé vodní nádrže byly v minulosti hojně realizovány převážně jako jednoúčelové. Teprve s jejich realizací a po začlenění do okolí často vyvstaly i další možnosti pro jejich využití. Dnes se „rybníky“ navrhují převážně jako nádrže víceúčelové, neboli multifunkční. Při výstavbě, obnově nebo rekonstrukci nádrží, zejména pokud k tomu je žádána podpora z veřejných prostředků, je třeba preferovat jejich veřejné funkce, kterými jsou především: retence povodňových průtoků, zlepšování kvality vody, zkvalitňování krajinného prostoru, podpora biodiverzity, podpora rekreačního zázemí obcí. Je kladen důraz na vhodný návrh břehové a doprovodné vegetace s následnou péčí. Malé vodní nádrže jsou dle zákona 214/1992 Sb., významným krajinným prvkem, jejich zbudování může výrazně zvýšit ekologický potenciál dané lokality. Předkládaný článek se zabývá využitím malých vodních nádrží realizovaných či vyprojektovaných v několika posledních letech. Na těchto konkrétních příkladech pak hodnotí jejich možný potenciál rekreačního využití nebo případné střety ve využití a funkčnosti nádrží.

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EVALUATION OF REVITALIZATION MEASURES IN TERMS OF RECREATIONAL POTENTIAL IN TŘEBÍČSKO MODEL REGION

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Abstract
The aim of the article is to evaluate the revitalization measures from the point of view of recreational potential. The issues of revitalization of water elements, recreation potential and methods are described in the introduction. These methods can be used for evaluation. Herádky retention basin in Třebíč region is characterized in materials and medhods. This part focuses on the evaluation results of revitalization of Herádka model area. In the results, revitalization measures in terms of recreational potential in Třebíčsko model region is evaluated. The factors of external and internal environment are analysed using SWOT analysis and the results of questionnaire survey are assessed. Finally, possible measures to improve recreational possibilities in this area are suggested.

Key words: restoration, recreational value, evaluation methodology, model locality Třebíčsko

Introduction

Recreation and functional recreational potential play an important role both from the social, economic and environmental point of view. Multipurpose revitalizations of watercourses in urban and suburban landscape contribute, among others, to an increase in the recreational potential of the area and to the development of the region.
Today, objectives of revitalisation measures in urban and suburban landscape consist primarily in flood protection and promotion of biodiversity. While the "urban area revitalisation" is a relatively new way to enhance the recreational potential of the territory in the Czech Republic, we can find many advanced projects abroad e.g. in Bavarian villages and towns (Munich, Nuremberg, Miltach etc.).
Revitalisation measures for watercourses can be evaluated from many perspectives. On the basis of the methodology of Králová et al. (2001), Mikátová et al. (1998), we can evaluate different revitalisation actions and their contribution to the creation of better living conditions for selected species of animals and vegetation. Monitoring of hydromorphological indicators (HEM) is used for observation of hydromorphological characteristics of streams and floodplains (Langhammer, 2008). The recreational potential of the landscape can be assessed on the basis of components of the tourism potential, according to Bína (2002), according to the method Terplan (1974) Vepřek (2002), Ciurea et al., (2011), and according to Pralong (2005).

Material and methods

The goal and expected output of this work is to evaluate the importance of revitalisation measures in terms of the recreation potential of the landscape, and therefore their impact on the development opportunities of the region.
The model location selected for the purpose of this work is a locality in the village Rudíkov in the administrative district ORP Třebíč. The observed Mlýnský Creek, on which the revitalization of the retention basin Herádka took place, flows around the village. Indicators, criteria or elements from the following methods were used to evaluate the site:

- Recreational aspect - the tourism potential according to Bína (2002).
- Environmental aspect - suitability of living conditions for selected species of birds, mammals; the suitable environment for the growth of vegetation according to Králová et al., (2001), suitable conditions for amphibians according to Mikátová et al., (1998)
- Technical and hydrological aspects - evaluation of the implemented revitalisation actions according to the Vrána et al. (2004).

The method of public preferences (survey) was applied within the observed territory. Its aim was to obtain information about the awareness and satisfaction of citizens with their surroundings of the retention basin Herádka. The research was conducted through a written questionnaire both in an electronic and printed form. The electronic form was published on the website survio.cz. The survey was performed directly in the model locality in the surroundings of the retention basin. The target group were residents of the village and other citizens, who know and visit the retention basin and its surroundings. The obtained data were used for elaboration of proposals for improvements of the situation and for an increase in the recreational potential of the area.

Lastly, a SWOT analysis focused on evaluating the recreation potential for local residents in the model area was performed. The assessment covers both implemented revitalisation actions and the wider context, which may affect the recreational potential of the area of interest in the future.

Results

The outcome of this work is to evaluate the implemented revitalization of the retention basin Herádka in the model locality in the village Rudíkov, ORP Třebíč, in terms of the recreation, environmental and technical-hydrologic aspect, and subsequently, to draft measures to increase the recreational potential of the area.

The following parameters of the methodology according to Bína (2002) were selected and analysed to evaluate the revitalisation measures in the model locality, see Table 1.

The creation of the retention basin, planting of trees and building of the islet led to an increase in the diversity of landscape elements. It can be said on the basis of the evaluation of the indicators that the diversity of landscape elements has improved the conditions for hiking, biking and rural tourism in the locality. The retention basin is also a water body suitable for swimming and sunbathing.

Tab. 1: Effect of revitalization measures on the elements of recreational potential (Blažková, 2014)

Element of tourism potential / Revitalization measure	Measure 1. Building of retention basin	Measure 2. Creation of littoral zone	Measure 3. creation of island	Measure 4. Planting of woody plant	Measure 5. Creation of non-draining pool
Appropriateness of landscape for hiking	✓	✓	✓	✓	✓
Appropriateness of landscape for cycling	✓	✓	✓	✓	✓
Appropriateness of landscape for water recreation	✓	✓		✓	✓
Appropriateness of landscape of type forest/mountains	✓		✓	✓	✓
Appropriateness of landscape for rural tourism	✓		✓	✓	✓
Appropriateness of landscape for sport fishing	✓	✓			
Appropriateness of landscape for watching water birds	✓	✓	✓	✓	✓
Appropriateness of landscape for swimming	✓				
Appropriateness of landscape for sunbathing	✓				
Appropriateness of landscape for photographing water birds	✓	✓	✓		✓
Appropriateness of landscape for horse riding	✓		✓	✓	✓

There is also a forest in the vicinity of the site of interest, which offers the possibility of mushroom hunting and nature walks. Planting of more trees has improved the microclimate conditions in the area, leading to an emergence of many shaded areas, where people can relax.

All the implemented measures had an impact on increasing the local biodiversity. Many plants and animals associated with aquatic habitats, such as the mallard (*Anas platyrhynchos L.)* and broadleaf cattail (*Typha latifolia L.)* can be observed at the site. From the recreational point of view, areas suitable for observing and photographing of the flora and fauna have been created. Owing to the repaired field path the site is now more accessible from the village for both pedestrians and cyclists. The more diverse environment of the revitalised valley also encourages the development of horseback

riding. The construction of the retention basin and littoral zone resulted in suitable conditions for fishing. In order to prevent the risk of a conflict between recreational aspects and nature conservation, only extensive fish breeding has been introduced based on the natural production of the basin.
The environmental aspect was evaluated in the work according to Králová et al. (2001) and Mikátová et al. (1998). The suitability of the living conditions for aquatic species of birds - mallard (*Anas platyrhynchos L.),* mute swan (Cygn*us olor G.)* and common coot (*Fulica atra L.)* were evaluated within the site. The observed mammals included muskrat (*Ondatra zibethica L.)* and water bat (*Myotis daubentonii K.).* After evaluating the suitability of the conditions for amphibians in this area, it was concluded that the conditions are most favourable for the life of the toad (*Bufo bufo, L*).
After evaluation of selected indicators of the methodology according to Vrána et al., (2004), an increased retention capacity of the retention basin in the landscape was confirmed. The littoral zone positively affects the infiltration of water into the underground. Planting of trees and sowing plants on a part of the banks of the dam strengthens and protects the environment against the soil erosion. A massive concrete spillway was built at the site, the appearance of which does not fit into the surroundings and it disrupts the view of the landscape. The dam is made from the soil excavated from the backwater zone, which is a material that is natural for this area.
The work includes a survey, the purpose of which was to determine the visitors' satisfaction with the reconstruction of the retention basin and its surroundings. The survey showed that mostly only locals and people from nearby towns are aware of the existence of the retention basin Herádka. Of the 98 respondents, 94% believe that the revitalization of the retention basin had a positive impact on the surrounding countryside. According to 80% of the respondents, the appearance of the surrounding countryside has improved, 65% of respondents said that the best advantage was the return of an open body of water into the valley, 53% respondents chose the improvement of ecological stability. 69% of respondents use the retention basin for their recreational activities. Visitors use the retention basin primarily for swimming, sunbathing and its surroundings are used for walking and cycling, as well as for winter skating. 69% of the respondents said that the access to water has improved on the site, respondents also appreciated the emergence of new pools usable for swimming, and 57% of respondents appreciated the emergence of new recreational areas (see Fig. 1).

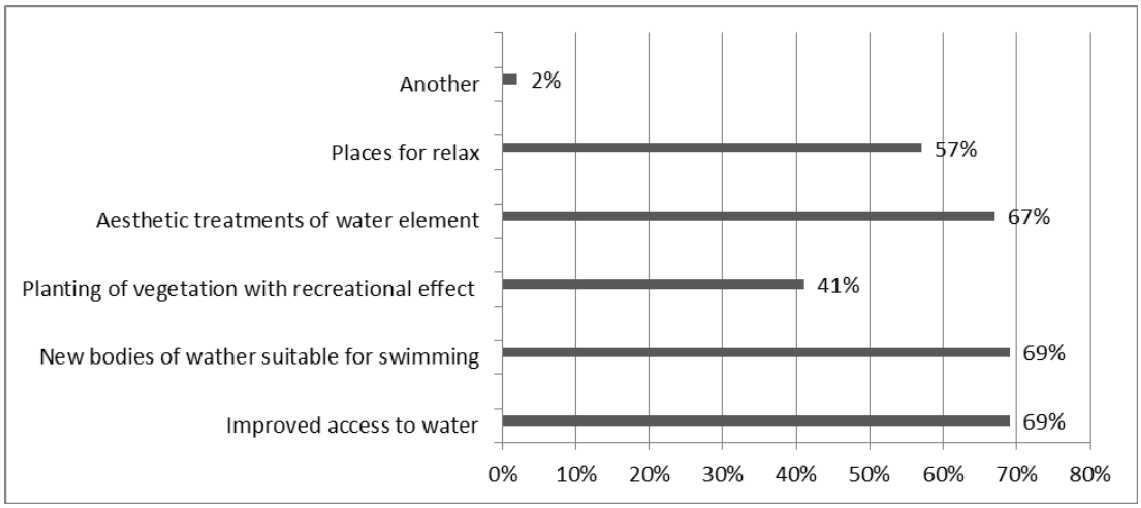

Fig. 1: Change of recreational conditions for local residents after set up of retention basin (Blažková, 2014)

As for the negative effects of the revitalized retention basin, 97% of respondents opted for the increase in the number of bothersome insects, 13% indicated another option (presence of litter and increased number of visitors in the area). In addition, 3% of respondents selected visually inappropriate tree species and the disruption of the general appearance of the landscape.
Additionally, a SWOT analysis of the recreational potential for the model locality was elaborated within the results, see Table 2. The strengths include good transport accessibility, as it is located near the main road. There is also a reinforced path leading to the retention basin, which is used as a cross-country trail in winter. On the contrary, the weaknesses include a low promotion of the locality, the existence of which is known mostly only by locals. Opportunities for the site could lie in increasing the promotion and public awareness of the implemented revitalisation.

This could contribute to an increase in the visitor rate, but in such an extent as to avoid any conflicts between the conservation and recreation perspectives. Threats, which could disrupt the natural environment of the locality, include intensive fishing and recreation.

Tab. 2: SWOT analysis of recreational potential of model locality (Blažková, 2014)

Strength • Good accessibility • Part of the nature park Třebíčsko • Close to the cycle path • Strengthened road • Suitable place for cross country skiing • Benches around the water basin • Suitable place for relax • Near the forest	**Weaknesses** • Insufficient promotion • Absence of natural attractions • Visitors are only locals • Rubbish surrounding the retention basin • Unsuitable place for allergic person • The place is unlighted at night • Small beach
Opportunities • Increase in promotion • Higher number of visitors • Support agro-tourism of the village • Another revitalizing measures • Build an nature trail	**Threats** • Intensive fishing • Intensive recreation • Water pollution • Emergence of the competitive location • Overgrowth of invasive plant • Insufficient funds in village

Measures were proposed to increase the potential of recreation in the area on the basis of the collected data. An excessive amount of municipal waste and an insufficient number of rest areas in the vicinity of the retention basin were observed as disadvantages in the survey. In order to improve the situation, it was suggested to install wooden furniture equipped with waste bins at the site, which would not disrupt the appearance of the surrounding countryside.
The retention basin Herádka is used for swimming in summer and the surrounding banks of the basin serve as a beach for sunbathing. The survey showed that locals consider the place of access to the water and capacity of the beach as inadequate and poorly maintained. They suggested an extension of the beach, regular maintenance of vegetation and mowing of the adjacent meadows, which could also serve as a place of relaxation for visitors, e.g. for allergy sufferers.
The surrounding landscape is suitable e.g. for biking, walks of parents with prams etc. According to the survey, locals are not satisfied with the quality of the local unpaved roads. They suggested paving of the road with the use of natural materials (e.g. compacted gravel).
After the construction of the retention basin, the area has become more suitable for observing and photographing of animal and plant species associated with aquatic environments. This article proposes a creation of a wooden pier, from which people could see the entire surface of the water. Steps could be attached to the pier allowing access to the water.
Most inhabitants of the nearby villages do not know the locality, which can be a consequence of an insufficient promotion. On the basis of these facts, it was suggested to install information, educational and safety boards in the vicinity of the retention basin.

Discussion
The objectivity of the methods currently used for evaluation of revitalization measures is a frequently discussed topic. Most of the used techniques are suitable for a quick and easy evaluation of revitalization effects. In the example of the retention basin Herádka, revitalization was evaluated from three perspectives (recreational, environmental and technical-hydrological) for the reason of the complexity of the assessment of the implemented revitalisation measures.
The methodology by Bína (2002) was used for evaluation of the recreational potential. Its updated version from 2010 is also often used in the Czech Republic. Unlike the methodology of 2002, this methodology is focused on the critical aspects affecting the development of tourism and recreation in larger territorial units, which are municipalities with extended territorial scope. The methodology is not suitable for evaluation of the recreational potential in the model locality Herádka, as it is just a small territorial unit.
Recreational effects of revitalizations of watercourses are often underestimated in the Czech Republic and they are primarily associated with positive environmental and hydrological effects. Abroad,

recreational benefits of revitalizations are far more frequent, which is reflected in their evaluation, e.g. in Jung et al., (2013), Golet et al. (2006).
According to the results of the survey, 70% of respondents have heard about the term revitalization, but the term is little known in association with an aquatic environment. This may be due to the fact that revitalisations of watercourses have been implemented only since 1990s in our domestic conditions and there is little awareness of them.

Fig. 2: Retention basin Heradka and proposed measures to increase of recreational potential (mapy.cz – own work)

Conclusion
The purpose of this article was to evaluate the importance of revitalization measures in terms of the recreation potential of the landscape, or their impact on development opportunities of the region.
The methods used for evaluation of the particular locality of the retention basin Herádka in the Třebíčsko Region included the method of evaluation of the recreational potential according to Bína (2002), the environmental assessment methodology from Králová et al. (2001) and Mikátová et al. (1998) and the technical-hydrological aspect according to Vrána (2004).
A questionnaire survey was realised in the model locality aimed at obtaining the views and perceptions of local residents with regard to the revitalized retention basin. The results confirmed that locals use this place for their recreational activities, mostly for walks and for swimming in summer. However, the locality is little known to the wider community.
Measures, which could improve the public awareness and increase the recreational potential of the area, were suggested on the basis of the results of the survey, SWOT analysis and field research of the author of this article.

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Souhrn
Cílem práce bylo vyhodnocení revitalizačních opatření vodních prvků z hlediska rekreačního potenciálu krajiny, potažmo jejich vlivu na možnosti rozvoje regionu.
Na konkrétní lokalitě retenční nádrže Heráda na Třebíčsku byly aplikovány a vyhodnoceny metody hodnocení rekreačního potenciálu dle Bíny (2002), ekologické hledisko posouzené metodikou od Králové a kol. (2001) a Mikátové a kol. (1998) a technicko-hydrické hledisko dle Vrány (2004).
V modelové lokalitě bylo realizováno dotazníkové šetření, zaměřené na získání názorů a vnímání místních obyvatel na revitalizovanou vodní nádrž. Dále byla provedena SWOT analýza rekreace v území.
Z výsledků dotazníkového šetření, provedené SWOT analýzy rekreace území a na základě vlastních terénních šetření byla navrhnuta opatření, která přispějí ke zlepšení povědomí obyvatel o revitalizaci retenční nádrže a ke zvýšení rekreačního potenciálu území.

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FREE TIME OF ELDERLY PEOPLE – WAYS OF COUNTERACTING THEIR SOCIO – ECONOMIC EXCLUSION

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Abstract
Ageing society is one of the most serious socio-economic problems of the contemporary Europe, and thus this process also affects Poland. Within the next several decades, the number of elderly people in our country will be growing, and widely understood effects of this process (e.g. the hazard of socio – economic exclusion) must be an area of interest of many public life spheres.
In the presented study, the authors refer to the results of the survey entitled "Together Close to Krakow – Integrated Development of the Near-Krakow Functional Area", conducted under the project co-financed from EEA funds (Financial Mechanism of the European Economic Area 2009-2014). The survey included, among others, learning about preferences of elderly people with regard to free time (the inhabitants of the southern neighborhoods of Krakow) in the context of cultural and leisure potential of the "Close to Krakow" functional area. For the analysis, the oldest age group of 64 and more was selected.

Key words: elderly people, free time, tourist and leisure offer, exclusion

Introduction

Ageing society is one of the most serious socio-economic problems of the contemporary Europe, and thus this process also affects Poland. Within the next several decades, the number of elderly people in our country will be growing, and widely understood effects of this process, e.g. the hazard of socio-economic exclusion of this group, must be an area of interest of many public life spheres. Not only are elderly people beneficiaries of the pension system, but also a group with the greatest amount of free time. Thus, it is worth analyzing the issue of free time management by elderly people – the most desired activities from their point of view.
In the opinion of many authors, elderly people's ability of managing their free time and their selection of active lifestyle, helps them to maintain both mental and physical fitness, and enables them to enjoy this phase of life (Nowicka, 2006). In addition, this issue has its economic dimension, as the concept of "silver economy" assumes the concentration of marketing activities on this group in the context of the offer of services and production of goods aimed at making use of the purchase potential of elderly people and satisfying their consumer, living and health needs.
The issue of free time is raised by many investigators, representatives of different fields of science. Despite the fact that it is a relatively young category, many attempts have been made to define it.
And so, the first attempts to define what free time is appeared in the late 19th century, when the American economist T. Veblen stated that "it includes the whole of human life apart from work, and the amount of this time is determinant for the affiliation to the working or privileged class" (Ibidem).
Otherwise, free time, according to the classic definition by J. Dumazedier, "the time allocated for activities to which people dedicate voluntarily beyond their professional, family and social duties" (Nawojczyk, 2011). It can be used in different ways, namely for rest and entertainment or e.g. for development of interests or acquisition of knowledge. Saving up free time has become "an achievement of the modern society" (Ibidem).
It is also worth mentioning the definition of free time proposed in Poland by J. Danecki: according to him, it is the time "required for: regeneration of forces consumed for work, expansion of general and professional knowledge, family life, upbringing of children, personal interests, cultural needs and participation in public life" (Nowicka, 2006).
The issue of free time of elderly people in Poland is raised relatively rarely. This is puzzling, for example, due to the aging process of the Polish society we have been dealing with for some time, and whose factual sizes will become visible within the next few decades.
M. Kaczmarczyk and E. Trafiałek claim that activities that are preferably undertaken by elderly people are mainly: classes within the University of the Third Age, voluntary service, namely acting for people in need, and senior clubs, under which the following activities are organized: trips to cultural institutions, excursions, tourist and open air trips and participation in various types of training and courses, e.g. computer and the Internet (Kaczmarczyk, 2007).

Materials and methods

In the presented paper, the authors refer to the results of the survey conducted under the project co-financed from EEA funds (Financial Mechanism of the European Economic Area 2009-2014). The survey was part of the project "Together Close to Krakow – Integrated Development of the Near-Krakow Functional Area", implemented under the program "The Development of Towns by Strengthening the Competences of Local Government Units, Social Dialogue and Cooperation with Representatives of the Civil Society", under the Financial Mechanism of the European Economic Area 2009-2014.

The survey included, among others, learning about preferences of elderly people with regard to free time (the inhabitants of the southern neighborhoods of Krakow) in the context of cultural and leisure potential of the "Close to Krakow" functional area. For the analysis, the oldest age group of 64 and more was selected.

Results and discussion

The surveys whose partial results will be presented in this part of the article were carried out in 2015 on the area of six housing estates of the southern neighborhoods in Krakow, with a sample of 150 people aged above 15.

The surveyed elderly people had the greatest amount of free time from among all the age groups – almost 36% of them specified that it was above 24 hours a week, and nearly one fourth had 13-24 hours of free time a week. The greatest number of free time was declared by the oldest inhabitants of the surveyed area on Saturdays and Sundays (half of them) and by every fourth on weekdays. Only a small group of elderly people was not able to specify when they had free time.

Elderly people mainly spend their free time with their families (half of cases) but also gladly on their own (almost 36% of the answers). Most rarely chosen answer was "with friends" – only approx. 14% of the respondents choose their company in their free time. During their free time, the respondents most often read books and newspapers and meet their family or friends. On the contrary, they relatively rarely choose forms that are associated e.g. with physical activity (walks, sports, trips outside the city) and with participation in cultural events or going to the cinema, theater – approx. 6% of the respondents indicated these forms of spending free time. The way of spending free time not acceptable by elderly people turned out shopping, declared only by single respondents.

When planning their free time, the respondents usually use information included in the press (35% of the selected answers). For one fourth of the respondents, a source of such information is the mass media (radio, TV). On the other hand, never used forms are electronic forms and promotional leaflets. This situation is opposite than in the case of other age groups, for which the fastest and the most attractive forms when planning their free time are websites and social media (almost 40% and approximately 19% of the indications, respectively) (Fig. 1).

Forms of active leisure most often selected by the surveyed elderly people are walks (for over half of them), less frequently (for every tenth) Nordic walking and other exercises outdoors. On the contrary, such activities as biking or practicing team or individual sports seem of no interest to the respondents. It is particularly alarming that one fifth of the surveyed elderly people declare no physical activity. In the case of forms of active leisure, clear differences are visible as compared to younger people (Fig. 2).

The survey the results of which are presented refer to the "Close to Krakow" functional area, namely the area of five near-Krakow communes. The respondents were asked to comment on the current and potential tourist and leisure offer.

It turns out that, presently, the respondents most often choose such attractions in the area of the surveyed communes that are associated with history and cultural heritage of the region (e.g. folk group "Mogilanie", local legends, museums and chambers of memory) or with tourist and natural qualities (e.g. parks and nature reserves).

Tourism forms that are of the greatest interest for the elderly people are hiking tourism and cultural tourism (in both cases 30% of the selected answers), and of the least interest - agritourism and spa and wellness services (no respondent indicated this answer). On the contrary, the following forms enjoy a relatively small interest: bike tourism, natural tourism or pilgrimage tourism (selected roughly by every tenth respondent). Particularly clear differences depending on the age can be observed in the case of pilgrimage tourism, enjoying greater interest among elderly people, as well as bicycle tourism, selected, in turn, more often by younger people (Fig. 3).

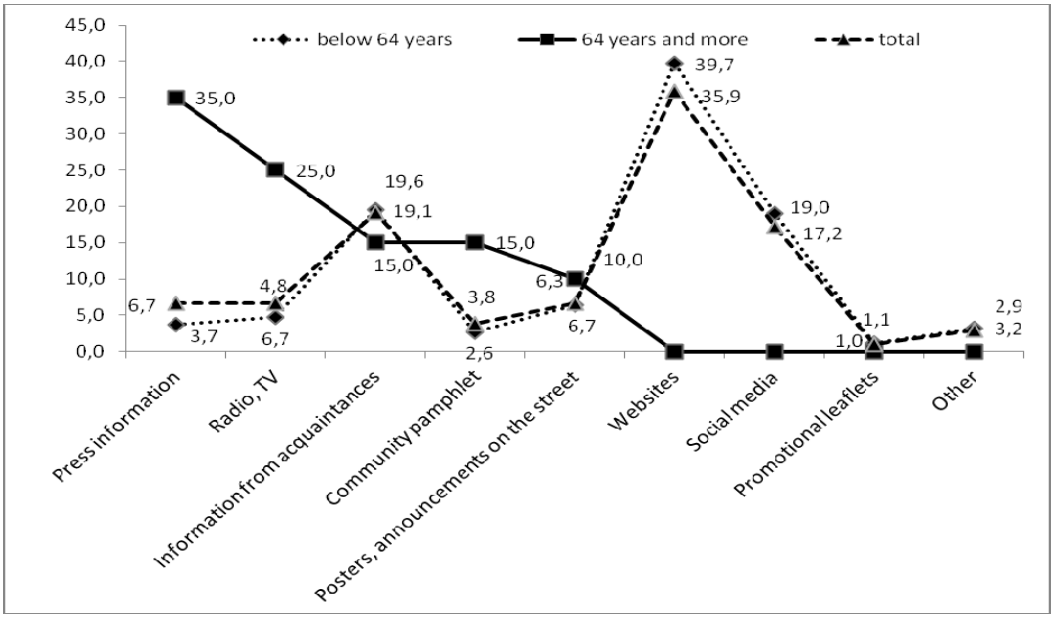

Fig. 1: The structure of the respondents by the answer for the question about sources of information used when planning free time (%)
Source: prepared by the authors on the basis of interviews.

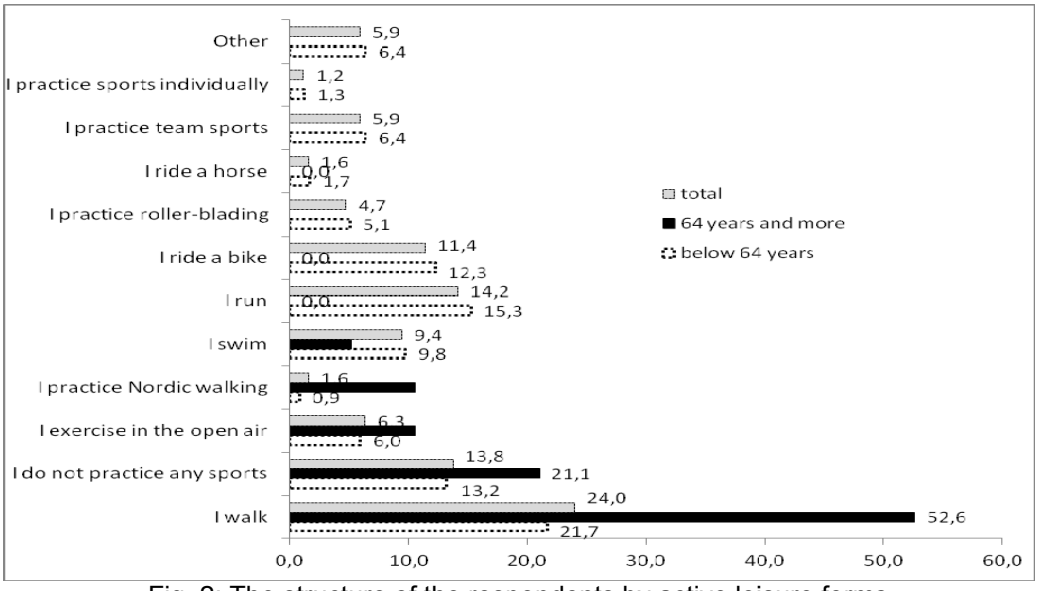

Fig. 2: The structure of the respondents by active leisure forms
Source: prepared by the authors on the basis of interviews.

Plans related to the development of the functional area assume a large extension of the tourist and leisure offer. However, it is important that it should be preferably adjusted to the visitors' preferences. Therefore, the surveyed were asked a question about facilities they would preferably use in the area of the communes in question in the future. Elderly people indicated natural and educational paths (in almost one fifth of the cases) and tourist routes, as well as monuments and other elements of the region's cultural heritage. On the other hand, they are not interested in facilities related to sports, which expressly differs them from the respondents from younger age groups.

The present vogue for ruralism, related, e.g. to interest in local craft and handicraft, as well as purchase of healthy, ecological food, is also reflected in the respondents' answers. Well, if in the "functional area" local little stores appeared with products straight from a farmer or products directly from a farm were offered, people from the oldest age groups would be definitely more interested than younger people. Interest in the participation in cultural events related to local traditions and cultural heritage was similar in both age groups.

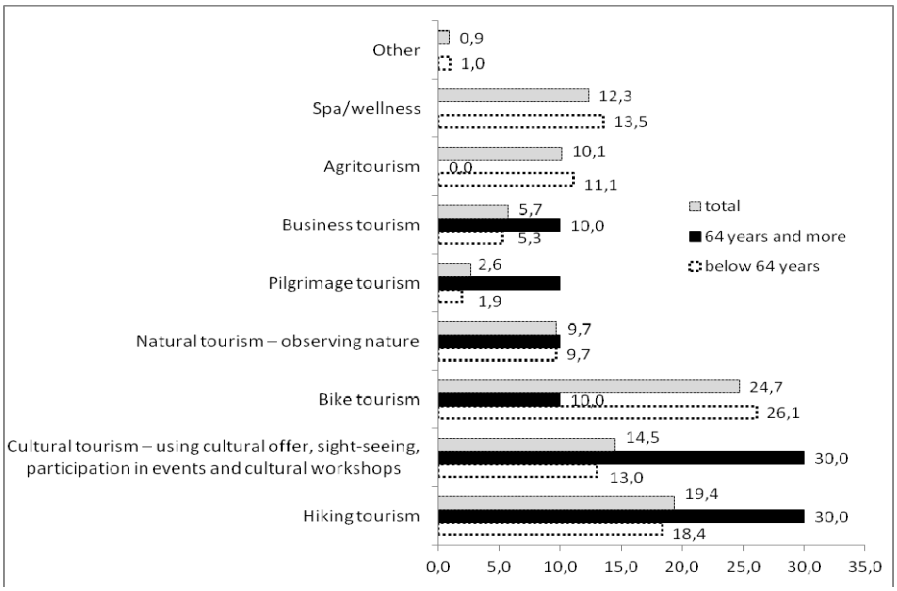

Fig. 3: The structure of the respondents by choice of the most attractive tourist offer offered by the communes from the functional area (%)
Source: prepared by the authors on the basis of interviews.

Another element important from the point of view of planning the offer for potential tourists visiting "the functional area" is undoubtedly the way of advertising attractions of the region. It turns out that the vast majority of the inhabitants of the southern neighborhoods of Krakow (more than 75% of the selected answers on the Fig. 4) would like to be informed about cultural events that are held within "the functional area". Additionally, more often it was the case of younger people than elderly people - in the second group almost half expressed such a desire.

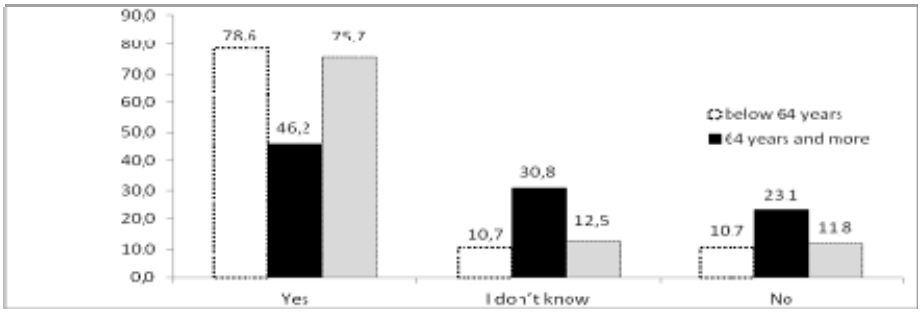

Fig. 4: The structure of the respondents by answers to a question whether they would like to be informed about cultural events and offers, etc. concerning the "Close to Krakow" area
Source: prepared by the authors on the basis of interviews.

The best way for the respondents to receive information about this type of events would be, in the case of elderly people, SMS, e-mail and traditional mail, whereas for younger people the most favorable form includes websites, and social networking portals and e-mail.

Conclusion

The presented survey results covering elderly people from the southern neighborhoods of Krakow indicate that they have the greatest amount of free time as compared to other age groups. Although, presently, most of them do not use the attractions offered by the communes of the "Close to Krakow" functional area, it is important that they declare interest in the future offer of tourist and leisure services. However, it is important that the proposals typically addressed to elderly people include the special character of this age group, namely health condition, ensuring convenient access or the fact that they dispose of restricted funds.

It seems that a suitable offer of free time management for elderly people in the vicinity of Krakow may be a good example of matching the system of activities aimed at social inclusion of elderly people and prevention of their socio-economic exclusion.

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Souhrn
Stárnoucí společnost je jeden z nejdůležitějších sociálně-ekonomických problémů moderní Evropy a tento proces se týká také Polska. Během nejbližších několika desetiletí se počet starších osob v našem státě bude zvyšovat a široce chápané výsledky tohoto procesu (např. sociálně-ekonomické vyloučení) musí být předmětem zájmu mnoha veřejných sfér. V představené prezentaci se autoři odkazují na výsledky výzkumů „Společně Blízko Krakova – integrovaný rozvoj podkrakovské funkční oblasti", provedených v rámci projektu spolufinancovaného z fondů EHP (Finanční Mechanismus Evropského Hospodářského Prostoru 2009-2014). Výsledky zahrnovaly seznámení se s preferencemi seniorů, pokud jde o volný čas (obyvatelů jižních čtvrtí Krakova) v kontextu kulturního a rekreačního potenciálu funkční oblasti „Blízko Krakova". K analýze byla vybrána nejstarší skupina věku 64 a starší.

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GEOEDUCATION AS AN IMPORTANT PART OF ENVIRONMENTAL EDUCATION

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Abstract
Geoeducation is a relatively new term in the field of environmental education. It aims to create relationship between people and their home place or region, consequently ecological awareness of children and youth is raising, which may reflect positively towards the older generation. Geoeducation´s importance lies in the fact that so called abiotic nature is involved in the process of familiarization with nature and its protection. Geoeducation is not focused on geology only, but it seeks to create interlinks among geology, soil science and geomorphology of the landscape. Different educational methods should be applied by age. In general, we distinguish 3 levels: up to 6 years (preschool age), 6-10 years and 11-18 years. Specific teaching tools and time capacity are linked to each level. Preschool level put emphasis on mediating perceptions on localities, without systematic teaching, all of this through games and stories. Geoeducation model for 6-10 years consists of outdoor education by simple learning forms and teaching in the classroom focused on basic properties of rocks and mineral through simple experiments and stories. More demanding forms of learning are suitable for children of 11-18 years, consisting of both teaching in nature and in classroom with a comlex approach to the topic, with option of multiple-day activities. In general, the best form of providing information and interpretation is the story.

Key words: geoeducation, educational methods, outdoor activities, interpretation

Introduction

Education in the field of abiotic nature *geopedagogy or geoeducation* fills the gap in extracurricular ecological education (Gray 2012). It does not intend to substitute school education, but to extend it and focuses on nontraditional forms of providing information (teaching). The objective is not a complex educational system, but rather insight into the functioning of natural laws and landscape development through games, interpretations and stories (Pásková 2014, Ptáček a Růžička 2012). Specific procedures and teaching tools are being applied according to 2 aspects - age and locality specification.

The term *geoeducation* is in world and European context known:

a) from the National Geographic point of view when National Geographic has adopted the term *geo-education* to describe education about our world. A well-rounded geo-education provides young people with a fundamental understanding of how the human and natural worlds work at local, regional, and global scales.

b) as a form of out-of school education focuses specially on geology being applied in Great Britain.

Our concept is somewhere in the middle – landscape geofactors are involved in general context and their regional specificities and uniqueness are introduced within concrete localities.

Fig. 1: A good interpreter has to attract attention of children. A suitable form is providing information through stories. Use of field notebook is recommended to assure better educational results. (Photo: J. Doucek)

Materials and methods

Didactics varies according to age. There are 3 specific cathegories: under 6 years (preschool), 6-10 years (primary school), 11-18 years (higher primary and secondary school) (Pauk 1981). Teaching forms are divided into indoor and outdoor activities where teaching tools can be used in both places according to needs. The information is of general and regionally specific character (Ziegler 2004). Teaching tools can be very diverse (collections of rocks and minerals, maps, pictures, workbooks, field notebooks, presentations, tests, puzzles etc.). Geoeducationalist should have science education, fundamental pedagogical skills, knowledge on regional natural conditions and be above all a good interpreter (Fig. 1)

Results

The 4 examples of realized educational blocks:

A. Children of 6 – 10 years: 1 hour in the classroom , 1,5 hour in the field, Boskovice furrow territory. Teaching is running in the classroom, up to 16 pupils, teaching tools: regional topographic map, pictures of localities, basic mineral collection (12 pieces), typical regional rocks (10 pieces), pencil, crayons, paper. Firstly, basic minerals, their properties, are introduced, with emphasis on a specific property for each of them. Pupils touch minerals and test selected properties. Selected rocks of close surroundings are introduced (conglomerate, siltstone, shale, black coal of Boskovice furrow, granodiorite of Brno massif, devonian limestone, ortogneiss and marble of Moravikum, all described, touched and their occurence is shown in the map, pictures of localities, pupils draw their favourite place with its rock outcrop in the surrounding. Indoor teaching ends up with discussion about pictures. Field education takes place in 2 localities in the distance within 500m of distance, outcrops of permian shales with plant fossils, outcrops of permian conglomerates with different rock pebbles, 5-minute familiarization with the locality, samples collecting, a short lecture, locality tour with questions and samples showing, lecturer uses a hammer, children takes notes and draw what they saw and what impressed them the most, present what they will tell to parents home and on walk.
B. Preschool age - 1,5 hour, a general educational game in the garden, up to 12 children, (2 adults and a lecturer), teaching tools: minerals of various colour, shape and grain size, unconsolidated materials of different colour (clay, sand, loess, gravel, gravel pebbles), loam of different colour, ceramic raw material, paper, crayons. Materials will be displayed and introduced, everyone choose what he/she likes best and try to explain to other why, playing with materials, creating simple shapes (sun, cloud, ball, house…), drawing pictures of materials (Fig. 2), modelling various things using ceramic loam, children showing (describing) what they created.

Fig. 2: For children up to 10 years it is recommended to involve additional activities such as drawing (Photo: J. Doucek)

C. Children of 11 – 18 years: field excursion 3-4 hours, surroundings of Brno reservoir, up to 16 pupils per a lecturer, teaching tools: regional geological map, geological hammer, magnifier, geol. compass, knife, diluted HCl, field notebook, pencil, simple description of route including localities will be available to pupils 2 day before excursion, the route leads from Brno dam to Veveří castle (9 km), lecturing during the excursion, detail description of following localities: dam, Sokolské koupaliště creek, loess and terraces at Sokolske koupaliště, Rokle, NM Kůlny, Zouvalka, NM Junácká louka, Veverka, Veveří castle. The localities are presented from the geological, pedological, geomorphological point of view as well as cultural-historical development of the landscape. Someone repeats provided information on each locality, pupils making notes into field notebook, taking samples. The excursion ends up with pupils´presentations about what the saw putting stress on the most interesting issues (Bajer2012).

D. Children of 6 – 10 years: 1,5 hour, in general stones around us, up to 16 pupils per a lecturer, teaching tools: basic geological map of the Czech Republic, suitcase with collection of basic igneous, sedimentary and metamorphic rocks (25 rocks), pictures of important places in the Czech Republic (Sněžka, Karlštejn, Praděd, Pálava, Macocha, Blaník, Říp etc.) paper, pencil, blind map of the Czech Republic. Firstly, each type of rock is introduced, everyone can see and touch them, geological map is presented, everyone has a look at it and find landmarks (Prague, Brno, the Labe river, the Vltava river, Šumava mountains, Beskydy mountains etc.) in the map, pupils mark places which they have visited with their parents, groups of 4 pupils choose 2 rocks and try to find and mark localities of their occurence discussing with a lecturer, they get pictures of localities and rocks and try to find them in blind map, they discuss their favourite rocks and localities with a lecturer.

Discussion

The main objective of geoeducation is not substituting or extending curriculum, but an offer of direct contact with natural materials (Fig. 3) in their natural conditions, conscious familiarization with their properties and importance through stories and interpretations with emphasis on interactive game – teaching.

An important part is the effort to show genius loci of home landscape and create space for identification of an individual with his/her home place.

Fig. 3: If possible, children should have opportunity to see, touch and test properties of natural materials (Photo: A. Bajer)

Conclusion

Geopedagogy (geoeducation) as a new term and discipline in the enviromental education field is nowadays becoming more familiar to teachers and school children. Currently, there is no detail concept of geoedcuation in the Czech Republic, but being developed at this moment. The methodology is based on 3 levels according to the age. Different teaching tools are being used for different levels. The paper presents 4 examples of already realized educational model blocks.

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Souhrn
Geopedagogika je relativně novým pojmem na poli environmentálního vzdělávání. Jejím cílem je vytváření vztahu jednotlivců ke konkrétnímu místu či regionu a tím výrazně zvyšuje ekologické povědomí dětí a mládeže. Což se zpětně může pozitivně odrážet i směrem ke starší generaci. Geopedagogika je důležitá v tom, že do procesu seznámení se s přírodou a její ochranu vkládá prvek tzv. neživé přírody. Geopedagogika není zaměřena jen na geologie, ale naopak se snaží o propojení geologie, pedologie, geomorfologie v konkrétní krajině. V souvislosti s vývojem dítěte je třeba aplikovat při výuce různé metody. Obecně lze hovořit o 3 stupních, a to předškolním stupni, prvním stupni základní školy a druhém stupni základní školy. Na každý stupeň jsou navázány konkrétní didaktické nástroje a časová kapacita. U předškolního stupně je kladen důraz na zprostředkování vjemů na konkrétních lokalitách, bez systematické výuky, vše formou her a příběhů. U prvního stupně základní školy po pobytu v přírodě, kde se zapojují jednoduché výukové formy, následuje výuka v učebně zaměřená na základní vlastnosti hornin a minerálů, formou jednoduchých pokusů a příběhů. Pro žáky druhého stupně základních škol jsou již vhodné náročnější výukové formy zahrnující pobyt v přírodě a výuku v učebně s komplexním přístupem k tématu s možností vícedenních tematických aktivit. Obecně platí, že nejlepší formou předávání informací a interpretace je příběh.

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GEOMYTHOLOGY: AN USEFUL TOOL FOR GEOCONSERVATION AND GEOTOURISM PURPOSES

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Abstract:
The relationship between the geosciences and myths is studied by geomythology which is understood as an explanation of the geological and geomorphological features using the supernatural forces and beings. The geomythological aspect can be regarded in relation to cultural, historical and spiritual meaning or value of geodiversity and it can be included into the holistic concept of geotourism (that means that geotourism should contain abiotic, biotic and cultural components). The article briefly discuss the reasons why geomythological aspect could be used for geoconservation and geotourism purposes and it presents several examples (especially geosites and geomorphosites) from the Czech Republic where the geomythological value is (or can be) used for these purposes.

Key words: geosites; geomorphosites; Bohemian-Moravian Highland; Blaník Knights' County geopark

Introduction

Geological and geomorphological features and processes have always attracted people's attention. These features and processes have been exploited and used already in prehistoric time: people exploited mineral resources (e. g. Paleolithic extraction and treatment of the hornblende in the region of Krumlov forest or at Stránská Rock in Brno), they used the suitable landforms as shelters (e. g. Býčí skála in Moravian Karst) or as the important communication paths (e. g. Moravian Gateway which was used as an important communication link and trade path between the Baltic and Mediterranean (the Amber road led through)). Later, the castles and fortresses were built on the significant elevations for defence reasons (e. g. Vranov castle in the Southern Moravia) or the natural processes as the watercourses were used for the transportation of the materials or as a source of energy.

Besides this exploitation of geological and geomorphological features and processes, people also tried to explain their origin. Usually, the explanations were linked to the supernatural forces and some of the explications were rather fantastic while others contained surprisingly accurate description of the features and processes. These explanations formed the basis for the myths related to the various sites (Mayor 2004).

In the Czech Republic there are a lot of sites of the geological and geomorphological interest (geosites and geomorphosites) connected to the myths. Probably the most distinctive "magic" site is the Říp hill (Fig. 1), the basaltic knob with the Romanic rotunda of Saint George on the top. The site is usually linked to the legend about the arrival of the old Bohemians to the Czech lands. The genesis of the specific rock formations was often explained as the work of the devil which is reflected in the toponyms; there are a considerable number of geological and geomorphological sites bearing the name of the devil (e. g. Čertovy skály in Vizovice highland, eastern part of the Moravia).

The relationship between the geology, geomorphology and myths, respectively mystical explanation of the features and processes is studied by the partial sub-science called geomythology. The term was introduced by Vitaliano (1968) and it is understood as an explanation of the geological and geomorphological features using the supernatural forces and beings. The importance of geomythological aspect is also recognised by Gray (2013) who includes it into the cultural value of geodiversity.

Fig. 1: The basaltic knob of Říp which rises above the flat landscape of the central part of Bohemia has a mythological value and it is related to the arrival of the old Bohemians (photo: L. Kubalíková)

Geomythology: what is it and how it can be related to the geoconservation and geotourism activities

Mayor (2004) defined geomythology as "the study of etiological oral traditions created by pre-scientific cultures to explain - in poetic metaphor and mythological imagery - geological phenomena such as volcanoes, earthquakes, floods, fossils, and other natural features of the landscape". Vitaliano (1973) recognizes two distinct types of geological folklore: the first in which some geological feature or the occurrence of some geologic phenomenon inspires the folklore explanation and the second being garbled explanation of some actual, relatively recent geological event (e. g. earthquakes). Mayor (2004) says that some of the geomyths are rather fantastic and give an emphasis on supernatural details, however, others give a surprisingly accurate description of geological and geomorphological features and processes and they are based on rational speculation and gives various examples of the geomythical explanations of the geological and geomorphological features and processes. A wide range of case studies from all around the world is presented by Piccardi and Masse eds. (2007): there are several examples from Mediterranean area connected to old Greek and Latin mythology (e. g. D'Orazio 2007, Dini et al. 2007, Agnezi et al. 2007), case studies focused on biblical events (Trifonov 2007, Roberts 2007) or articles about geomyths from Africa (Shanklin 2007), India (Chandrasekharam 2007) and North America (Vitaliano 2007) (Fig. 2). The role of geomyths and legends in today's science is discussed by Masse el al. (2007) and Lanza and Negrete (2007). The geomythology is also being studied in Australia with an emphasis on the aboriginal interpretations of the genesis of various geosites and geomorphosites, especially meteorite craters (Hamacher and Goldsmith 2013, Hamacher 2014). The geomythological aspects of the fossils are examined by Mayor (2000, 2005).

Fig. 2: Devil's Tower (Wyoming, USA), the eroded remnant of a laccolith with an exemplary columnar separation of volcanic rock. Indian tribes living in this area explained the columnar jointing as the claw marks made by the giant bear (photo: L. Kubalíková)

Gray (2013) appreciates the significance of geomythological aspect within the geodiversity concept and he states that geomythology can be regarded in relation to cultural, historical and spiritual meaning or value of geodiversity. Some case studies proved that the existence of myths connected to the geosites and geomorphosites helped to recognise and appreciate the scientific value of a geo(morpho)site by local communities; by relating the scientific value and myths, the people who are not scientists and usually do not understand the scientific language, more easily accepted the need to preserve scientifically valuable geosites and geomorphosites (Motta and Motta 2007).

Therefore, the geomythological aspects can play an important role in geoconservation and geotourism activities; the emphasis on geomythological aspect can bring positive perception of a site and consequently the positive perception of the possible geoconservation activities. The use of geomythology for geotouristic purposes and interpretations also present an interesting possibility and occasion how to bring geoscience to people.

Moreover, the legends and myths about a geological/geomorphological features and processes are an important part of a local or regional identity; keeping them alive and linking them with other aspects of the nature protection helps to re-build and foster local/regional identity and healthy relationship to geosites or geomorphosites in the area. Geomythology can also contribute to the regional

development; e. g. exploiting the geomythological aspect in relation to a local or regional product or service can become the important aspect of developing local economy.

Some examples of the geotouristic use of the geomythologic value in the Czech Republic

The first concepts of geotourism were presented already in the beginnings of 90's of the 20th century and they usually said that geotourism was oriented to the use of geological and geomorphological features of the landscape (Hose 1995, Hose 2000, Dowling and Newsome 2006). Later, the concept was enriched by the cultural component (National Geographic 2005). Today, the emphasis on a tight relationship between the natural and cultural aspects is given: Martini (2012) states that geotourism allow tourists to know the local geology but also to better understand that this geology is closely related with all the other assets of the territory, such as biodiversity, archaeological and cultural values, gastronomy, etc., Dowling (2013) says that geotourism is sustainable tourism with a primary focus on experiencing the earth's geologic features in a way that fosters environmental and cultural understanding, appreciation and conservation, and is locally beneficial; the geotourism should thus include Abiotic, Biotic and Cultural components. These cultural components, eventually cultural values can be perceived according to the Gray's concept of geodiversity values and they include cultural, spiritual and historic meanings, e. g. folklore, sacred sites, and sense of place (Gray 2013).
All around the world as well as in the Czech Republic, there are many examples of the areas, geosites and geomorphosites with a high geomythological value. Here, we will present some of them and the emphasis will be given on the use of geomythological value for geoconservation and geotourism purposes.

Blaník Knights' County geopark

Blaník Knights' County geopark, as the name suggests, is based especially on the rich history that is closely related to the landscape. It is one of the emblematic sites of the Czech Republic and as well as Říp hill in the Central Bohemia, this area is connected to the myths (according to the legends, there are sleeping knights inside the Blaník mountain and they will rise up when the Czech country will need it the most). The geoheritage is represented by the oldest rocks in the Czech Republic (Moldanubian) and also by the cryogenic landforms (e. g. boulder fields, frost cliffs) which can be found on the Velký and Malý Blaník. The local products are promoted with the trade mark "Blaník Knights' County regional product" which uses the typical feature of mythological persons: the knight's helmet (Fig. 3). The presentation of this geopark is therefore tightly linked to the mythical events and it is successfully used as a trade mark (http://www.blanicti-rytiri.cz/).

Fig. 3: The design of the trade mark "Blaník Knights' County regional product" uses the typical feature of mythological persons connected to the site: the knight's helmet and it supports regional products of the Blaník Knights' County National Geopark and surrounding area (source: Administration of Blaník Knights' County geopark)

Legends connected to the rock formations in Žďárské Vrchy Hills

Žďárské vrchy Hills form an upper part of a large Hercynian Mountains – Bohemian-Moravian Highland situated in the central part of the Czech Republic. A unique feature of the area is the occurrence of isolated groups of rocks or rock formations, which often have the character of towers. As these rock formations dominate the landscape and as they have always astonished local inhabitants, they served often as an inspiration for the myths. Usually the myths were linked to the work of devil, e. g. the sites Tisůvka, Peperek and Rozštípená skála ("Split Rock"). One of the legends says that the Split Rock is the remnant of a dam which was built by the devil as he intended to flood the village of Hamry. The devil carried the boulders from nearby for the dam construction, however, he did not make it in time and he dropped the last and the largest boulder to the Peperek hill. This strike was so strong that it split the dam and buried the silver mines on Peperek. Since then, the site is called "Split Rock" and the mining of silver was stopped. The legend has certain real basis – there

were existent silver mines on Peperek and in 1328, there was an earthquake which could cause the inexplicable events that were later explained as a work of the devil (Zelená Křížová 2011).

These myths form an important part of the cultural and spiritual heritage of the area and some of them were collected and published (e. g. Jurman 1991, Zelená Křížová 2011). They play an important role in the local identity and they have a potential to be used for educational, conservation and geotourist purposes.

Fig. 4: Rozštípená skála (Split Rock): the myth says that the site is a remnant of a dam constructed by the devil as he wanted to flood the nearby village

Žižkův stolec (Žižka's throne)

A site called Žižkův stolec (Žižka's throne) is situated near Velké Meziříčí town, on the southern border of Bohemian-Moravian Highland. The site is located near the important historical communication which led along the Oslava's valley. Today it is situated very near the highway Prague – Brno.

The site consists of several boulders (local paragneiss) which are arranged in a circle, the inner diameter oscillates between 7 and 8 m (Fig. 5). Already in the prehistoric times, the circle structures defined the areas that served for the cult purposes (Podborský 2006), but in this case, the history is younger (Cendelín et al. 2014). Inside the circle, there is another boulder which is shaped into the rectangular block which has been traditionally related to Jan Žižka – the leader of the Hussites in the 15th century. Another important feature of the site is Hajn's linden which grows inside the circle. The tree is related to the old local family clan which played an important role in local economy already since 17th century. Although there is no evidence that the circle was used for the cult ceremony as it was believed and the last research did not confirm any connection between the site and Hussite leader, Žižkův stolec presents a good example of the agricultural and landscaping activities of the Hajn's family in the past (Cendelín et al. 2014). For the local inhabitants it has still a touch of mystery and it forms an important element of local identity. It can be seen that a myth can be born later and it is not only the question of prehistoric times.

Fig. 5: Žižka's throne and Hajn's linden – it was believed that the site was visited and used by Hussite leader Jan Žižka, but it was not confirmed. However, the linden inside the circle can be considered an evidence of the long-lasting landscaping activity of our ancestors.

Conclusions

The geomythological aspect forms a notable part of cultural value of the geosites and geomorphosites. Generally it raises the overall value of a site as regarded from the geotourist point of view; the existence of the myths connected to the site can significantly increase the interest of the visitors. In some cases (e.g. Blaník Knights' County geopark) the geomythological aspect forms a basis for various geotourist activities; it helps to promote regional products and it significantly contributes to the regional development.

The legends and myths related to the geosites and geomorphosites also play an important role in the keeping and further consolidation of the local and regional identity which helps local inhabitants to be proud on their heritage. Some case studies cited above proved that the existence of the myths and legends connected to geosites or geomorphosites helped for better understanding of the need of protection and its acceptation by the local inhabitants. Therefore, the geomythological aspect of geologically and geomorphologically important localities should not be neglected; on the contrary, it is evident that myths and legends can serve the geoconservation and geotourist purposes with success.

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Souhrn
Geologické a geomorfologické tvary a procesy fascinovaly lidskou společnost již odedávna. Člověk se vždy pokoušel tyto procesy a jevy vysvětlit, v minulosti často sahal k interpretaci pomocí nadpřirozených sil apod. Vztahy mezi geovědami a mytologií se zabývá relativně mladý vědní obor zvaný geomytologie, který se pohybuje na hranici věd o Zemi, etnografie, historie, archeologie a folkloristiky. Termín byl poprvé představen koncem 60. let (Vitaliano, 1968). Geomytologie jako věda se zabývá vysvětlením geologických jevů a procesů pomocí mýtů a legend (Mayor, 2004). Existují dva

druhy geologických mýtů: jeden je představován mýty, které vznikly jako interpretace vzniku nějakého tvaru reliéfu, druhý se zaměřuje na často přehnaný a překroucený popis zejména katastrofických událostí (Vitaliano, 1973). Ačkoliv mnohé mýty jsou spíše fantastické a odrážejí bujnou lidskou představivost, některé zahrnují i relativně přesný popis událostí a představují tak významný zdroj poznání geologických událostí v minulosti.
Celkové shrnutí problematiky geomytologie včetně případových studií z celého světa uvádějí Piccardi a Masse eds. (2007) ve sborníku prací Myth and Geology.
Význam geomytologie jakožto součásti kulturní hodnoty geodiverzity zdůrazňuje i Gray (2013) a novější definice geoturismu zahrnují využití kulturních složek (National geographic 2005, Martini 2012, Dowling 2013). Je tedy zřejmé, že kulturní složka (respektive spirituální, mytologická) je významná pro geoturistické aktivity, což je v souladu s holistickým pojetím geodiverzity a geoturismu. Motta a Motta (2007) uvádějí, že existence mýtů, které se vztahují ke geologickým lokalitám, napomáhají přijetí ochranných opatření pro tyto lokality místními obyvateli. Ti se díky existenci legend spjatých s geologicky a geomorfologicky významnými lokalitami (a tedy lokalitami hodnými ochrany) více s těmito lokalitami ztotožňují, považují je za významné (ne až tak z hlediska vědeckého jako právě z hlediska symbolického) a ochotněji přijímají navržená ochranná opatření. Navíc legendy spojené s místem pomáhají budovat a posilovat místní identitu.
Článek rovněž představuje příklady lokalit a oblastí z České republiky, které využívají nebo mohou využít geomytologickou hodnotu pro geoturistické účely: Geopark Blanickcýh rytířů, skalní útvary Peperek a Rozštípená skála ve Žďárských Vrších a lokalita Žižkův stolec nedaleko Velkého Meziříčí.
Geomytologie se tedy jeví jako jedna z možností, jak popularizovat vědy o Zemi, jak přitáhnout pozornost návštěvníků k lokalitě a případně jak ospravedlnit snahy vedoucí k zachování a ochraně vybraných geologických a geomorfologických lokalit.

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GUIDED TOURS TO THE WILDERNESS IN THE ŠUMAVA NATIONAL PARK

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Abstract
The Šumava National Park (NP) includes the vastest areas which have no-management or are extensively managed in the Czech Republic (or even in the Middle Europe). They offer "home" for large and rare animals (capercaillie, lynx, three-toed woodpecker, etc.) which are elsewhere extinct. The administration of the NP has trained local guides to offer guided tours to the wilderness of the national park. Trained guides participate in the sustainable tourism and have an income from it. Their acceptance of the protected area has significantly increased, because they refer to the visitors of the nature value. The guided tours have been run since 2008 and interesting data about the nature and the impact on it by specific groups of people were collected, as well as about the visitors themselves. The frequency of tours is of a major importance and the number of people in the group is recommendable to differ in respect to different biotopes. The results revealed that mostly visitors from cities are attracted by the wild nature and they are interested in the nature even if they are of very different professions. The cooperation of the nature protection body with local people helps to build up a beneficial relationship for both sides.

Key words: local guides, wild nature, ecotourism

Introduction

During the decades of running the ecotourism has shown it is not just a new trend, but thanks to the promotion of tourism in a particular area, it is of the benefit to all the participants. It has become an important part of the offers of modern tourist destinations. Its benefit needn't be always economical, but it is also important for the whole destination from the point of view of marketing. Its supporting pillar is the experience tourism, because "the fascination of the experience, the experience of the exploring is in the desire not only to go through the intensive experience, but to come back to the place of the experience. And not only this! The experience leaves its track in a tourist. A man remembers, recalls his experiences, lives through and interprets his experiences." (Štýrský, 2014)
The ecotourism includes activities related to the nature in protected areas. From this point of view the national parks are on the imaginary point of the tourists' interest. It is always necessary to keep a considerable respect and minimal impact on the nature, the countryside and the local inhabitants. Typical activities are active tourist forms such as hiking, cycling, hiking in high mountains and water tourism. (Zelenka – Pásková, 2012).
In the Šumava National Park the ecotourism activities contain excursions with local guides to the vast natural areas with the occurrence of surviving populations of big animals. The public and the visitors to the region of the national park know this programme under the name "Guided tours to the wilderness".

Materials and Methods

Preparing the project of educative excursions an important role was played by: the choice of the organizers of these accompaniments themselves. Since 2006 the Administration of the Šumava National Park has been organizing the local guides training in the frame of the support of the acceptation of the strictly protected area and at the same time of the direct economic profits of it for the local inhabitants. Up till now in a co-operation with the Academy of Science in České Budějovice three rounds of the guides training with the total number of 71 leavers have been organized. Besides the lectures thematically focused on the live and inanimate nature, but also on the history and the development of the territory, the guide skills connected with the practical exhibition in the terrain are a part of the parcel.
The guide's character and his engagement can make an extraordinary experience from a "common" excursion. The guide works with the people and that's why he has not only to present the facts and the knowledge in a correct way, but he must be a natural leader in the group, but at the same time its member. The job of a guide belongs both to the most various and at the same time the most interesting jobs. (Neužil, 2014)
In 2008 the Administration of the Šumava National Park prepared and started to organize the excursions with a guide to the usually no-go areas of the national park which are at the same time the most vast resting territories in the Czech Republic and up till now (and in most cases) there can be found the rare species of animal which somewhere else disappeared or are a rarity. This programme

presents the inaccessible areas with the concrete object of protection. In the very place the reasons for their strict protection and the interconnected limited entrance could be explained to the public.
While preparing the documents the co-operation of specialists in the nature protection and the workers in the field of the public use of the protected area was very important. The entrance to the specially protected areas of the national park needs the exception from the no entry to the 1st zone of § 16, para 2, letter b) of the law n.114/1992 digest, about the protection of the nature and the countryside.
The conditions of the protection specified the periods when it is possible to enter the specially protected areas so that the disturbing influence was as small as possible. The frequency of the movement along the route had to be "accidental", not periodical so that the regularity of the disturbing was not noticed by the animals. For this reason in the most susceptible areas the maximal number of excursions i.e. the entrances with a guide in a year was specified. The number of persons in a group shows itself both as the point of view of disturbing and as the direct influence on the environment (terrain trampling). At the same time a non-negligible point of view is, of course, an effective performance of a guide.
While the workers of the protection of nature paid particular attention to untouched specially protected areas of the nature, the people working with the public concentrated on the total planning of the actions with a view to a quality offer serving its aims as well as possible. It mainly concerned the logistic from the place of the departure to the end of the action and the interconnected length and time demand. Not least it was necessary to provide the organizational back up for the publicity before the beginning of the programme and the following marketing of the current actions.
The main factor was the fact the accompaniments would not be done by the employees of the Administration of the Šumava National Park, but external trained guides. The persons interested in a job of a guide were trained in an orientation on particular routes and topics connected with them. The common orientation of all the persons was the presentation of the philosophy of the national park and of its aims. By the connection of the externally trained guides to the programme, the awareness of the national park grew up at the local inhabitants, and thus also the acceptation of its existence itself and the interconnected restrictions for everybody. The participants' fees became the guides' income. Already since the second year of the programme for the reason of the easier communication and with regard to the administration the guides have associated in a civic association which the Administration of the Šumava NP can co-operative with in an easier and more effective way. The co-operation of the local inhabitants with the common interest, where in the centre there is the nature of the national park, has been strengthened.

Fig. 1: Map of the main areas of home of animals in the Šumava National Park
Source: author

Tab. 1: Areas and routes with the conditions for the entrance on the basis of the protection of the nature (Source: author)

Area	Number of routes	Period of the year (from to)	Frequency of the routes	Number of terms	Number of participants in the group
Křemelná canyon	3	1.6.-31.10.	once fortnight	25	11
Vltava mead	2	1.7.-31.10.	once fortnight	18	11
Trojmezná mountain	1	15.7.-31.10.	once fortnight	8	11
Smrčina mountain	2	15.7.-31.10.	once a month	8	11
Modravské plateau	3	15.7.-31.10.	once a month	16	8
Polom mountain	1	15.7.-31.10.	once fortnight	8	11
Total	12			83	

Results

There was made a cycle of educational excursion of middle and higher difficulties. According to the separate areas with different biotopes there were specified the conditions for the persons interested in the entrance and their knowledge. Owing to the limited number of places of the interested persons there was made an on-line reservation on the internet pages of the national park where you can find the main part of the publicity of the offer for the public, too. For the reliable booking of the occupancy rate and the participation in the excursions the payment for a guide in advance, which can be cancelled at the latest two weeks before the action and with the payment of the cancellation fee, has become the condition of the reservation.

Tab. 2: Number of excursions, their occupancy rate in 2008 – 2014 (Source: author)

Year	Number of areas	Number of routes	Number of excursions	Number of partitipants	Occupancy rate (%)
2008	5	7	41	385	65
2009	6*	8*	57	647	71
2010	5	7	58	686	74
2011	6	8	71	812	75
2012	6	9	77	829	70
2013	8	13	93	819	67
2014	8	14	90	737	62
Total			487	4.915	69%

If there is appointed a low number of participants in the group in advance (5 – 11), it is possible to get in touch with all the participants and to find out the motivation and the way leading to the participation in an excursion to the Šumava wilderness. From this information it has been made a basic profile of a participant: He is 28 – 38 years old. His profession is the most often a manager or an IT specialist. He commands an above-average income. He has a general knowledge, he follows media and he is interested in ecology and the environment.

From the beginning one of the conditions of the participation was an approval with the entry at his own risk. Everybody has to sign he was informed about possible dangers of the entrance to the “natural wilderness” and he agrees with the entry at his own risk. Doing this survey we incidentally found out the residence of the participants. On the basis of this information we can certainly say the most participants come to the natural wilderness from big cities.

Tab. 3: Residence of participants of excursions to the Šumava wilderness (2014) (Source: author)

Residence	Number of visitors	Number of visitors (%)
Praha	170	28%
Plzeň	71	12
České Budějovice	62	10
Brno	19	3
Klatovy	16	3
All others*	255	42
Foreigners**	10	2%
Total	603	100%

*A*ll the municipalities with the attendance under 10 persons*
***Country of origin: Germany, Slovakia, Croatia – always accompanied by another person (of the Czech origin)*

Discussion
The interest of the public in excursions into the "wilderness" persuaded us there is a demand for discovering the nature in its pure form in today's technic and consumer times. The visitors coming from big cities, where the possibility of meeting the nature in its untouched form is the lowest, are the most interested.
The trained local guides showed themselves to be excellent interpreters who have a strong motivation on the presentation of the national park which is intensified by the possibility of the direct earnings from the existence of the national park itself. Especially their work succeeded in producing the positive publicity from the side of the participants and it is not necessary to prepare or to finance much more expensive campaigns for the publicity of the whole programme which showed itself to be self-financed.

Conclusion
The offer of educational excursions into the Šumava wilderness in the national park makes the active meeting the wild flowers and the wildlife possible and so it is an ecotourism offer which can be put into biotourism. Although this specially oriented form of tourism is traditionally associated with the visit to the national parks and e.g.: safari in exotic countries, in the Šumava National Park it helps not only the marketing, but also the protection of the nature itself.

Fig. 2: Participants of the tours to the wilderness have to overcome different natural obstacles. (Photo: Štěpán Rosenkranz, Šumava NP Administration)

Fig. 3: Wilderness is the “home” for large animals as red deer.
(Photo: Marek Drha, Šumava NP Administration)

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Souhrn

Ekoturismus podporuje udržitelnost cestovního ruchu turistických destinací díky své ekonomickým i marketingovým přínosům pro všechny zúčastněné. Probíhá často v chráněných územích, národní parky nevyjímaje. V Národním parku Šumava sem patří výpravy s místními průvodci, tzv. Průvodci divočinou.
Od roku 2006 se pořádá školení místních průvodců Šumavou, které celkem absolvovalo 71 osob. Od roku 2008 Správa NP Šumava nabízí výpravy s průvodcem do nejrozsáhlejších klidových území ČR, kde se dodnes vyskytují vzácné druhy zvířat jinde vymizelá. Program vysvětluje široké veřejnosti důvody přísné ochrany a omezení vstupu. Jsou stanoveny podmínky ochrany přírody, kdy je možno do zvláště chráněných území vstupovat, tj. období roku, frekvence a počet výprav, počet osob ve skupině, atp. Výstupy odpovídající stanoveným cílům garantují externě vyškolení průvodci, kteří prezentují především filozofii národního parku a přírodní zákonitosti. Zapojením místních obyvatel narostly znalosti i akceptace místních obyvatel o národním parku. Omezený počet míst pro zájemce znamenal vytvoření on-line rezervace na internetových stránkách národního parku a platbu předem za průvodce. Placené doprovody dávají jistý příjem průvodcům, kteří se kvůli snadnější spolupráci sdružili do občanského sdružení. Celková obsazenost přes 2/3 nabízeních kapacit je pozitivním výsledkem extenzivní reklamy.
Mezi zájemce patří mladší až střední generace profesně zaměřená management a IT obory s hlubším zájmem o ekologii a životní prostředí. Na základě dotazníkového šetření bylo zjištěno, že nejvíce účastníků výprav do přírodní divočiny přijíždí z velkých měst. Vyškolení místní průvodci se ukázali jako výborní interpretátoři svého „domova“, o který se dělí s přírodou. Jejich motivace je umocněna možností přímého výdělku ze samotné existence národního parku. Díky jejich kvalitní práci dochází k pozitivní propagaci namísto nákladné kampaně celého programu, který je takto samofinancovatelný. Nabídka poznávacích výprav za šumavskou divočinou v národním parku je tedy ekoturistickou nabídkou zařaditelnou do bioturismu jinak tradičně asociovaného s návštěvou přírodních parků a například safari v exotických zemích. Program „Průvodců divočinou“ tak v Národním parku Šumava napomáhá nejen marketingu, ale i vlastní ochraně přírody.

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HABITAT MAPPING NPP SKALICKÁ MORÁVKA AS A BASIS FOR RECREATIONAL LAND USE

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Abstract
The aim of this thesis was to map the habitats of the Catalogue of habitats by Culek et al. (2010) with regard to the objective use the recreational land use of the NPP Skalická Morávka. At territory NPP (national natural monuments) is the subject of the protection of the natural stretch of the river Morávka in gravel sediments with their characteristic communities. This is a unique monument of the almost 102 ha in the Czech Republic which is necessary to protect but also promote sensitively in terms of recreation.Territory NPP was interspersed with square nets (50 x 50 m), which contained 454 nodes. At every point was made simplified the occurrence and registration of a particular species. Overall the 454 mapping points to characterize 13 habitat. The output is a map basis featuring the habitats that represents quality basis for future monitoring and management optimization not only in terms of recreational use.

Key words: care plan, riverbed, walking, knotweed

Introduction

Water flow as well as a significant landscape element is law-making connected to nature and landscape protection under Act no. 114/1992 Coll. However if it is a particularly valuable part of the landscape the entire area legally treated. Otherwise it is not in today's Skalická Morávka which was under public notice by the Ministry of Environment 543/2006 Coll. established a national natural monument (in Czech NPP). NPP Skalická Morávka is one of the few rare in the Czech Republic where the water flow is left to his spontaneous development.
The plan of care according to Šindlář and col. (2012) as the object of protection is given segment of the natural flow of the natural river Morávka in gravel sediments along with rare characteristic communities in stream and its surroundings area (Fig.). The objective of protection is to preserve the ecosystem and help to its natural extension not only in the protected area but also outside the defined territory with consideration to housing developement nearby stream. Šigutová (2009) showed the presence of two critically endangered species of vegetation by Procházka (2001) which include tree *Myricaria germanica* which is now known in the Czech Republic only from two localities (Grulich, 2012). With this tree species is connected to habitat M4.2 (gravel sediments with *Myricaria germanica*). This natural habitat threatening invasive neophytes knotweed *(Reynoutria spp.)* which is ubiquitous on the rivers in the river basin Morávka (Fig.).
Public awareness of this distinctive area is insufficient. Near the river Morávka are created two educational trails, which are listed in the guide, *"Naučné stezky Moravskoslezského kraje"* (2008). Educational trail "Headsprings river Morávka" located in the upper part of the stream. But his whole route belongs to the PLA (protection landscaping area) Beskydy and is far from the sights, about 7 km. The second natural trail "Surrounding Morávka in Skalice" touches marginal parts NPP Skalická Morávka. Three information boards closer to deal with issues relating to the territory. If we concentrate visitors to certain parts of the monument by particular habitats could create a quality educational trail presenting issues and endangered of this territory. Of course with regard to the protection of nature most valuable part.

Materials and methods

Habitat mapping on the NPP Skalická Morávka was carried out in two stages. The first habitat mapping was done Agency for Nature Conservation and Landscape Czech Republic (ANCLP) between the years 2001 to 2005 as stated in it' s publication Härtel, Lončáková and Hosek (2009). Now in the years 2007 - 2018 are updated (on the NPP has already taken place). Mapping is identical according to the Methodology updates habitat mapping layer (VMB) presented Lustyk and Guth (2011). However for dynamically transforming the locality the methodology is inadequate. We assume that in a short period (3-5 years) due to increased flows leads to remodeling or even transferring the channel and thus to conversion the characteristic of river and riparian habitats.
Presented VMB is different from the methodology presented Lustyk and Guth (2012) which was created especially for the purpose of defining the European network of protected areas Natura 2000. The user manual MapoMat.cz administered by the AOPK says Škarpec, Balak and Zohorna (2010) as

the output polygon vector layer together with a database segments habitat characteristics that are available for analysis in GIS software.
Preparatory work was carried out in environment software of ArcGIS when using "*grids*" went export maps NPP Skalická Morávka in measure 1:10 000. A square grid was huge 50 x 50 m with north-south orientation. All the nodes were numerically numbered. Network square knots intervened maximum distance of 20 m from the defined outer boundary monuments. The overall number of nodes reached 454. In the Excel program was created notebook with a list of herbal and woody potentially occurring species. On the NPP was transformed methodology used Vatolíková (2012) in habitat mapping flood stream Bečva.
Field mapping was conducted in late August and September 2013. Since dense not allow for excessive use of GPS inaccuracy proceeded to use a compass for better orientation in the field. On each of the 454 nodal points was an area of 5 x 5 m taken phytocenological simplified notation. For plant species were notated percentage coverage of tree, shrub and herb layer. At the base of phytosociological list was to characterize habitat according to Chytrý et al. classification *Katalogu biotopů ČR* (2010). It was divided by woody floor Konšel classification (1931) into tree levels (1, 2a, 2b, 3, 4). Coverage was graduated by 5 percent.
Data processing was carried out again in ArcGIS. Established are thematic map depicting mapped habitats. This map serves as a basis for creating recreational land use. According to the frequency of occurrence of each habitat and linkages between adjacent habitats were selected locations with recreational information use (nature trail) or tourism (outdoor school) use. From the present results if we would for example: 20 nodal points in close vicinity mapped 10 distinct habitats it seems this site in terms of usability recreational positive. These individual sites of interest were again drawn into thematic maps.

Results
According Culek *Katalog biotopů České republiky* in NPP Skalická Morávka was to characterize 13 different habitats of the total 454 raised points. Habitats are ranked in the following order: forest habitats (L), shrubs (K), riparian vegetation (M), anthropogenically influenced habitats (X), aquatic habitats (V) and secondary grassland habitats (T).

Tab. 1: General overview of each habitats

Habitat designation	Code habitat	Current habitats of the *Katalog biotopů ČR* according to Chytrého et al. (2010)	Total number of points	Percentage (%)	Habitat area (ha)
L2.2	**1**	Ash-alder alluvial forests	248	**54,75**	**62**
L2.4	**2**	Willow-poplar forests of lowland rivers	3	**0,66**	**0,75**
L3.2	**3**	Polonian oad-hornbeam forests	14	**3,09**	**3,5**
K2.2	**4**	Willow scrub of river gravel banks	54	**11,92**	**13,5**
M1.4	**5**	Riverine reed vegetation	1	**0,22**	**0,25**
M4.1	**6**	Unvegetated river gravel banks	42	**9,27**	**10,5**
M4.2	**7**	River gravel banks with *Myricaria germanica*	1	**0,22**	**0,25**
X7A	**8**	Herbaceous ruderal vegetation outside human settlements without neophytes	25	**5,52**	**6,25**
X7B	**9**	Herbaceous ruderal vegetation outside human settlements with neophytes	49	**10,82**	**12,25**
X12A	**11**	Stands of early successional woody species without neophytes	3	**0,66**	**0,75**
X12B	**22**	Stands of early successional woody species with neophytes	1	**0,22**	**0,25**
V4B	**33**	Running water with nature character without vegetation	10	**2,21**	**2,5**
T1.1	**44**	Mesic Arthenatherum meadows	2	**0,44**	**0,5**

The most common of forest habitat was L2.2 (*ash-alder alluvial forests*) which is located at 248 points. In the active stream causing rhythmic alternation of three main regularly occurring habitat gravel sediments. 54 points is to characterize habitat K2.2 (*willow scrub of river gravel banks*) X7B (*herbaceous ruderal vegetation outside human settlements with neophytes*) located in 49 points and habitat M4.1 (*unvegetated river gravel banks*) is mapped with 42 points. The rarest habitat M4.2 (*river gravel banks with Myricaria germanica*) is able to establish only a single point. The various habitats are described in detail in Blahuta thesis (2014).

The inputs are two thematic maps. At first *„Habitats on the NPP Skalická Morávka to 2013"* depicts the newly mapped habitats (see map no. 1). The second map *„Habitat mapping NPP Skalická Morávka as ground cover recreational land use information"* has already shown the potential recreational use of the landscape with the aid of habitat mapping. On the territory of the NPP were identified two so-called: "*spheres of interest*" - A, B (see map no. 2). *Sphere of interest* occupies the highest number of different habitats in a relatively small area. Nature trail is suitable primarily based from these selected localities.

Discussion

The study Šindlar (1997) states that if the time between floods long enough it can cause overgrown alluvial gravel deposits. Will to stabilize the riverbed and over time to the creation of forest habitats. In my opinion due to the uninterrupted succession be allowed to void the subject matter.

If it is necessary for the protection of residential buildings to regulate the water flow Morávky, it is advisable to use biotechnical modifications to flow. In particular as stated Šlezingr (2007) it is appropriate to use animated willow gabbione earth structures using coarse gravel material which is situated directly on the stream.

In my opinion should be updated VMB always at a distance of approximately three years after the flood because of the increase in vegetation. All parts of the flow stream and riverbed don't subject to increase vegetation. On the rocky bedrock soil immediately after the flood there is a primary habitat without vegetation M4.1. Due to this habitat succession gives rise to a "secondary" habitats M1.4, M4.2 and young grow shrubby willows K2.2. But not necessarily so and it may be maintained biotope M4.1 over a longer period.

On the territory there is a massive increase in invasive species, especially knotweed *(Reynoutria spp.)* and glandular impatiens *(Impatiens glandulifera)*. Against the *Reynoutria spp*. was using herbicide which according Blahuta (2014) slowed the spread but of course not entirely overcome. Even this negative phenomenon can be used as a representative example of the negative anthropogenic influence in the construction of nature trails. The public should be informed of the existence and danger of invasive plants and fight against them.

The proposed trail is possible to connect with the already existing referred to in the *Introduction* chapter. There would be a connection of nature trails: *Prameny řeky Morávky*, *Okolí Morávky ve Skalici* and *Niva Morávky*.

It is advisable as stated Šindlar (2012) consider extending the NPP Skalická Morávka because during the last floods in year 2004 there was a move in the main stream outwards monuments. On this affected riverside Povodí Odry (2001) conducted bulwark bank reinforcement boulder bank. This disrupting natural forces the threat to the object of protection and flow regulation. Management NPP should be tempted to purchase the estates and expand the monument. Border on the left bank of the stream to move to the edge of the agricultural fields flanking the monument (outside urban area), i.e. include adjacent stands located in the so-called *meander zone*. The boundary on the right side stream extend to the edge of the main road connecting the village Raškovice and Skalice at Frýdek-Místek and from the top to the steep slopes Skalická Strážnice. There would be not only to expand the monuments but also to increase the attractiveness recreation area.

Conclusion

The aim of the study was to explore by Chytrý *Katalog biotopů ČR* (2010) in NPP Skalická Morávka with regard to nature conservation and recreational land use. Thematic map of habitats used in this work as a fundamental basis for recreational use monuments.

Natural monument covers a territory of almost 101 hectare. Traffic access to the monument is favorable. At a distance of about 1 km are maintained roads along the river Morávka along both banks. The trail dealing with issues Skalická Morávka could be guided along the left bank of the river Morávka. The bank is interwoven with a wide range of disestablished walkways led along the bank. They would serve as the basis for trailing meadow Morávka. As a basic premise seems footpath inter alia, the riverbed of the river Morávka consistent with the protection of nature. Society should not be disclosed rarest habitat M4.2 (*river gravel banks with Myricaria germanica*) on the grounds of his protection. Unfortunately it proved the occurrence of habitats strongly influenced by anthropogenic (X), where has refugium wide range of invasive neophytes which is necessary to reduce with public support. The nature trail would be associated as these habitats. In the riverbed are situated willow scrub of river gravel banks or gravel sediments without vegetation.

Fig. 1: Typical view of the NPP Skalická Morávka - overgrown gravel bedload habitat for K2.2, riparian vegetation habitats formed X7B, X7A, M1.4. Adjacent meadow formed L2.2. (by J. Blahuta, 2013)

Fig. 2: Threatened habitat M4.2 with Myricara germanica by ubiquitous knotweed (Reynoutria spp.). (by J. Blahuta, 2013)

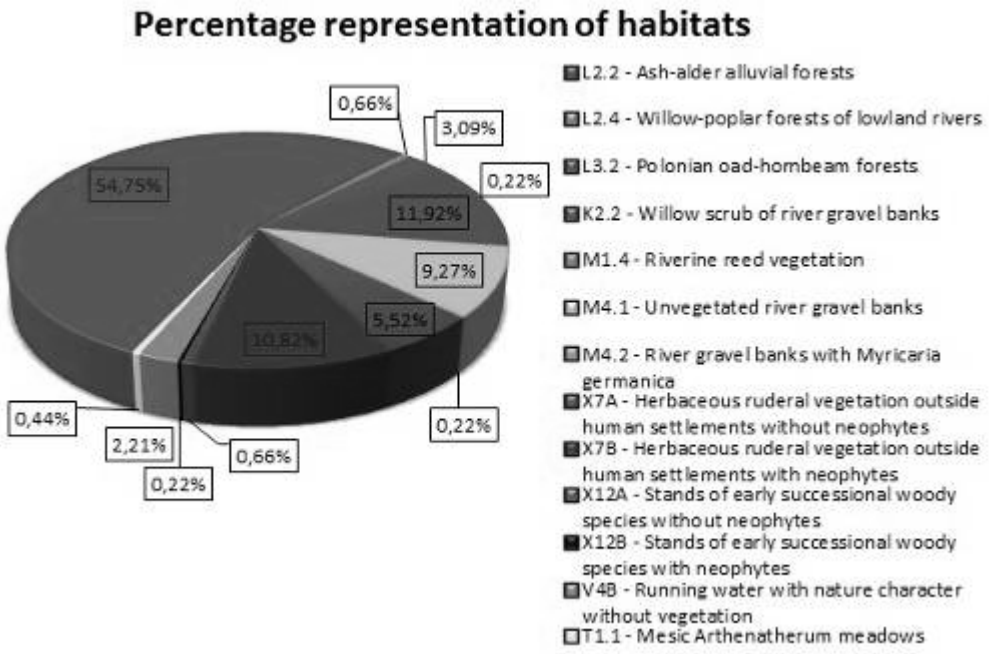

Fig. 3: Graphical representation of the percentage of each habitat

On the EVL (Special Area of Conservation) Niva Morávky takes place using the financial resources of the LIFE-NATURE (2007) liquidation of invasive knotweed *(Reynoutria spp.)*. EVL Niva Morávky includes the entire NPP Skalická Morávka. The last application herbicide was performed in 2012. The interim report Lacina, Halas and Švec (2009) monitors initial attempts to liquidate knotweed. On

monitoring and knotweed resistance to the herbicide gradually established Švec (2012) and Blahuta (2014).
The outputs of this work can be used for further research in this area and also in deciding how to deal with the possible use of educational and recreational attractions. In the future it is essential to protect local ecosystems and efforts to extend these communities not only on the river Morávka but also on other rivers of the Czech Republic.

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Souhrn

Cílem této práce bylo mapování stanovišť biotopů dle Chytrého (2010), s ohledem na objektivní použití rekreační využití na území NPP Skalická Morávka.
Na území NPP (národní přírodní památka) je předmětem ochrany část přirozeného toků řeky Morávky ve štěrkových sedimentech se svými charakteristickými společenstvy. Jedná se o ojedinělou památku o ploše téměř 102 ha na území České republiky, které je nutné chránit, ale také citlivě propagovat ruku v ruce s ochranou přírody. Území NPP bylo proloženo čtvercovou sítí (50 x 50 m), která obsahovala 454 vztyčných bodů. V každém bodě byl proveden zjednodušený fytocenologický zápis jednotlivých druhů. Na základě fytocenologického zápisu byl vylišen dle Culkova Katalogů biotopů (2012) biotop daného bodu.
Zpracování dat proběhlo opět v programu ArcGIS. Vznikla tematická mapa s vyobrazením zmapovaných biotopů (VMB). Tato mapa slouží jako základní podklad pro tvorbu rekreačního využití

krajiny. Dle četnosti výskytu jednotlivých biotopů a vazby mezi sousedními biotopy, byly vytipovány lokality s možnostmi rekreačně informačního.
Celkově bylo na 454 mapovacích bodech vylišeno 13 biotopů. Nejčastěji zastoupený lesní biotop byl L2.2 (údolní jasanovo-olšové luhy), který se nachází na 248 bodech. V aktivním řečišti docházelo k rytmickému střídání tří hlavních pravidelně se vyskytujících biotopů štěrkových náplav. Na 54 bodech je vylišen biotop K2.2 (vrbové křoviny štěrkových náplavů), X7B (ruderální bylinná vegetace mimo sídla s neofyty) se nachází u 49 bodů a biotop M4.1 (štěrkové náplavy bez vegetace) je zmapován u 42 bodů. Nejvzácnější biotop M4.2 (štěrkové náplavy s židoviníkem německým) se dokázalo prokázat pouze v jediném bodě. Bohužel je prokázán výskyt biotopů silně ovlivněných člověkem (X), kde nachází své refugium široká škála invazních neofytů, zejména křídlatky *(Reynoutria spp.)* a netýkavky žlaznaté *(Impatiens glandulifera)*, které je nutné za podpory veřejnosti redukovat.
Procentuální zastoupení jednotlivých biotopů na přelomu srpna a září roku 2014 je následující: L2.2 (54,75 %), L2.4 (0,66 %), L3.2 (3.09 %), K2.2 (11,92 %), M1.4 (0,44 %), M4.1 (9,27 %), M4.2 (0,22 %), X7A (5,52 %), X7B (10,82 %), V4B (2,21 %) a T1.1 (0,50 %).
Výstupem práce je tematická mapa s vyobrazenými biotopy, která představuje kvalitní podklad pro budoucí monitoring a optimalizaci managementu nejen z hlediska rekreačního využití.

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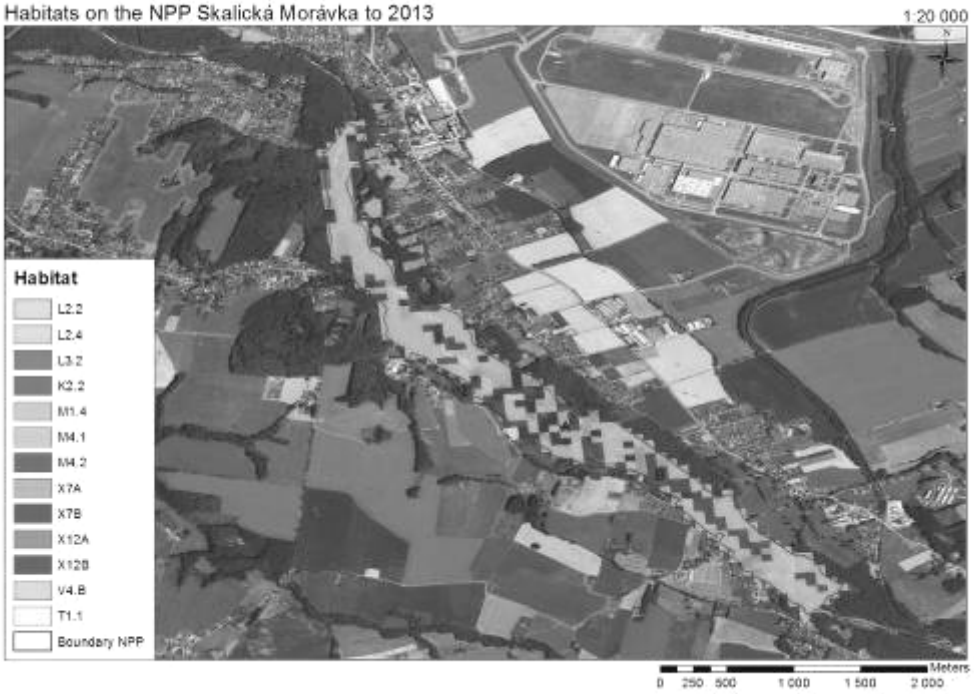
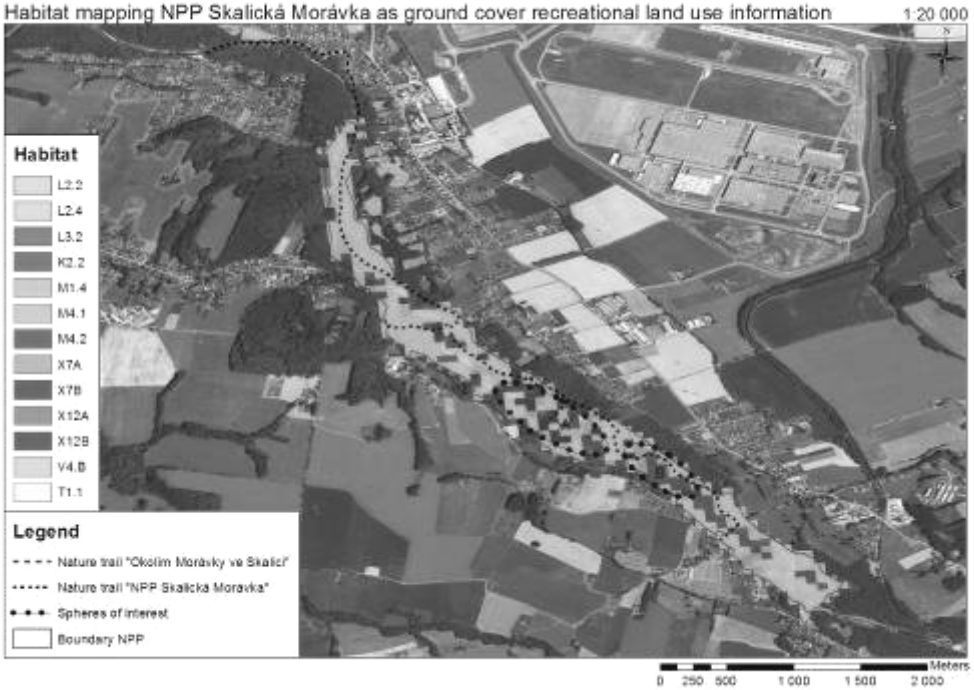
Annexes:

Habitats on the NPP Skalická Morávka to 2013



Habitat mapping NPP Skalická Morávka as ground cover recreational land use information



HEAVY HORSES IN CITY FORESTS OF OSTRAVA

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Abstract
The city forests of Ostrava are used for recreation activities of city inhabitants. The city forests manage forests with respect to forest management needs and with respect to recreation activities. The aim of this paper is to show how important are heavy horses in forest management of city forests. We analysed conditions in city forests and utilisation of heavy horses in logging operations among years 2003 - 2012. Heavy horses skidding had in average 32 % portion on total harvested timber.

Key words: skidding, logging, terrain conditions, recreation

Introduction

In the history of mankind horse was one of the most exploited animals. Since its domestication people tried to adapt this animal his ideas and especially different needs. The various types of horses then used always to specific functions. Horses had mostly two important roles – so called cold blood were used for transport of loads and so called warm blood become riding horses. For its versatility horses were exploited in agriculture, armies, mining operations in various other industries, probably the most however, performed the function of a means of transport, whether directly or hitching up the wagon. (Vogel, 2012)
Working horses were always closely connected with agriculture. The horses were in the forests exploited centuries ago, whether for skidding and transport of timber, the transport of seedlings, in the minor forest produce, and as a riding horse for forest service or in hunting activities. (Dušek, 1992)
Heavy horses can continue to play a role in human society, not only in the agricultural field but in all sectors: in cities and towns, for work and recreation, and for therapeutic purposes. (Leslie, 2013)
The aim of this paper is to show how important are heavy horses in forest management of city forests.

Materials and methods

Description of forest district Ostrava city forests and greenery, Ltd. was done from forest management plan. Company forest evidence was used as a source of information about volume timber felled on forest district. We calculated volume of felled timber for each skidding technology and calculated portion of each skidding technology used on forest district for period 2003 - 2012.

Results and Discussion

Ostrava city forests and greenery, Ltd. was established in November 1st 1992. Total forest land area is 1101,68 ha. Tree species composition in forest stands is composed of Norway spruce with portion of 20,3 %, Oak species with portion of 19 %, European beech with portion of 13,5 %, European larch and Maple species each with portion of 7,5 % and other tree species with small portion.
There are three forest categories: commercial forest covered 7,26 % of forest district forests, protective forests covered 0,24 % of forest area and majority of forest area is classified as special purposed forests with portion of 92,5 %. Special purposed forest category is composed of recreation forests which are dominant category, another two categories are protection of water resources and medicinal and mineral water resources.
Terrain conditions on forest district are suitable for use of farm tractors with skidding equipment on 85 % of forest land with slope inclination up to 25 %, 10 % of forest land is accessible with skidder 40 %, where slope inclination is up to and 5 % are terrains with slope inclination more than 40 %.

Table 1 shows the proportion of skidded timber by heavy horses or in combination with machine, and using only machine, mostly tractor. In almost all years prevails skidding with tractor, but since 2005 we can observe a slow increase in the use of an animal skidding. This increase peak in 2010, reaching the 54% share of animally skidded timber compare to 46% portion of tractor skidding. The highest amount of timber were skidded by horses in 2004, when was animally skidded 4.930,88 cubic meters of timber. Despite the largest volume in the total compared with tractors this year horses had a portion of only 26 % of the skidded timber, which was this year the highest total felling for whole period due to bark beetle salvage felling. Average portion of horse timber skidding for whole 10 years period is 32 %. Low concentration of timber is typical for salvage felling and it is very suitable to use horses in that conditions. Spinelli et all (2013) showed similar results in protective forests where animal skidding has

economic sense. We have to mention that usage of heavy horses has positive influence on environment because horses are renewable source of energy which do not need fossil fuels and have zero carbon dioxide cycle as proved Engel et all. (2012).

Tab. 1: Portion of timber skidded by heavy horses

Year	Way of skidding	Volume (m^3)	Portion (%)
2003	Horses	3 659,40	30
	Tractors	8 441,60	70
2004	Horses	4 930,88	26
	Tractors	14 373,12	74
2005	Horses	2 611,58	25
	Tractors	7 911,42	75
2006	Horses	3 533,89	31
	Tractors	7 997,11	69
2007	Horses	4 636,90	32
	Tractors	9 969,10	68
2008	Horses	2 755,04	32
	Tractors	5 943,96	68
2009	Horses	3 279,11	47
	Tractors	3 701,89	53
2010	Horses	2 511,34	54
	Tractors	2 125,66	46
2011	Horses	1 876,62	35
	Tractors	3 558,38	65
2012	Horses	1 576,84	33
	Tractors	3 251,16	67
2003 – 2012	Horses	31 371,60	32
	Tractors	67 273,40	68

Twelve coachmen worked on forest district during observed period with different portion on total volume of skidded timber by horses.
The company organizes the event "Day of the forest" to the public, when coachman presented to the public, how the horses are used in forestry and how to work with the horse in timber skidding. This action is very popular among city people and people are very happy to meet horses and they would like to see more horses in forest when they are walking in it.

Conclusion

Heavy horses have still important role in timber skidding operation. It is one of the nature friendly technologies which we can decide to use in forestry. Majority of city forest area is classified as special purposed forests with portion of 92,5 %. However portion of timber skidding by heavy horses is declining in last years, people who visit forests prefer to see horses in skidding operation rather than tractors and skidders. It is just question of economy if horses survive in forestry because many coachmen have problems with growing costs and stagnated incomes for their work. Tourists prefer usage of heavy horses in skidding operation especially for tourists with small children is meeting with horses welcome distraction of their walks.

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Souhrn
Společnost Ostravské městské lesy a zeleň, s. r. o. jsou převážně využívány k rekreačním účelům a z celkové výměry 1101,68 ha je do kategorie lesů zvláštního určení zařazeno 92,5 % plochy obhospodařovaných lesů. Kromě péče o rekreační potenciál lesů se společnost věnuje i řádnému lesnickému hospodaření, kde po provedené těžební činnosti je třeba soustředit dříví z lesních porostů na odvozní místo. Terénní podmínky na sledovaném území jsou optimální pro využití univerzálních kolových traktorů na 85 % plochy majetku. Traktory jsou dominantním prostředkem pro soustřeďování dříví a podíl na celkovém soustřeďování dříví v letech 2003 – 2012 činí 68 %. Soustřeďování dříví koňskými potahy na sledovaném majetku ve stejném období dosáhlo podílu 32 % z celkových těžeb, přičemž se na soustřeďování dříví podílelo celkem 12 kočích. Výhodou chladnokrevných koní jsou nižší náklady na soustřeďování dříví a také pozitivní přijetí rekreanty, kteří pozitivněji vnímají využití koní při soustřeďování dříví než využití traktorů. Zvláště u rekreantů s malými dětmi je setkání s koňmi vítaným zpestřením procházky.

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CHARACTERISTICS AND MANAGEMENT OF CLIMBING SECTORS

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Abstract
Rock faces provide one of the best environments where rare plants can grow and animals can live. The rock itself is also a memoir of natural history. This sensitive habitat is changing in respond to behaviour of rock climbers and is threatened to be damaged. Management of rock climbing in these areas can be done by examining of climbers preferences. We can treat rock climbers as a social category with its trends in behaviour. Thanks to social networks we can track ascents of each route and provide some analysis. For management of climbing sectors is important to know which routes are preferred to another. Dangerous routes and routes with lower or higher grade have fewer ascents than safe routes and routes with middle grade etc.

Key words: nature conservation, climbing route, rock climbing

Introduction
Rock climbing reached amazing amount of practitioners during last years and it is one of the most popular outdoor activities. Management of rock areas (nature conservation authority or climbing clubs) is trying to deal with this increase of visitors. There are numerous methodological sheets (Hušek 2008) and different policies published (Cater 2008, The Access Fund 2008, UIAA 2012), user guides and visiting rules hanged on the internet [1] as an appropriate response. Main documents in the Czech Republic are "Rules of climbing" [2]. All of it has one common goal – Sustainable development.
Climbing activity in its own definition uses rock surface as a tool. And each tool is exposed to wear and risk of damage or destroy. More on that if the tool consists of biotopes where rare plants grow and animals live. Impacts of rock climbing on plants, diversity, genetics, and animals were examined not by one author. There is some evidence of changing the population size and species composition (Kelly and Larson 1997, Camp and Knight 1998, Wezel 2007, Rusterholz, Verhoustraeten and Baur 2011), genetic variance (Vogler and Reich 2011), age structure (Kelly and Larson 1997) and so on. These impacts are mostly in correlation with the usage of the site by climbers.

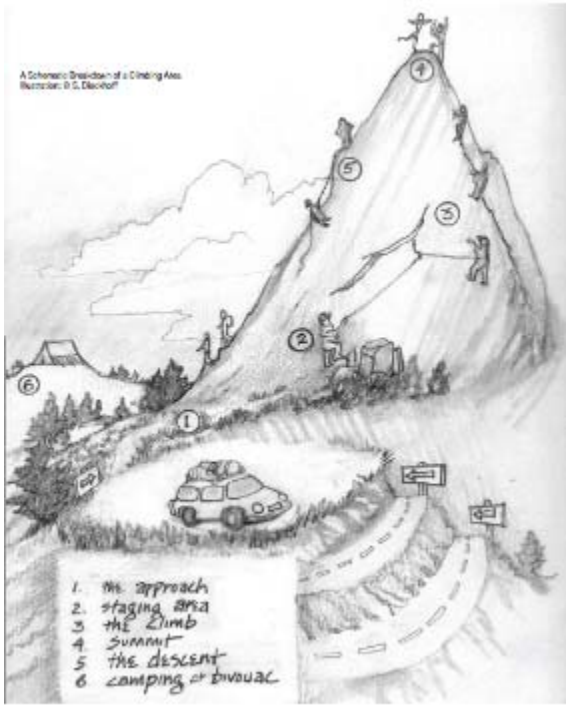

Fig. 1: A schematic breakdown of a climbing area
(S. Dieckhoff in A Guide to Climbing Management – The Access Fund, 2008)

Most researchers pay attention to the impacts and few are interested in climber's behaviour. Some effort can be seen in guides mentioned above (see Fig. 1). The closest study to our mind set is by Merrill and Graefe (1996). There is some correlation between how the climbing area is equipped (top-rope anchors, short length of approach…) and the attractiveness for beginners and all climbers tend to prefer route characteristics to general settings of the site. We think that this is the key moment for understanding the preferences. All climbers (traditional and sport climbers) agree that managers do not adequately understand the activity of climbing (Monz, Smith and Knickerbocker 2006).

Materials and methods

We choose the number of climbers as an indicator of usage of ecosystems. There are a lot of problems connected with analysing climber's attendance so we will stick to analysis within one climbing sector. Comparing several areas or provide some prediction would demand much more sources of data and to compare many characteristics, especially those spatial ones (infrastructure, distance from town, demography, health, wealth…), but also rock type, quality and composition of rock, historical development of climbing site (e.g. "soft" vs. "hard" grade) and many others..

We tried something like historical development in grades and count of routes (Kohn, Bajer 2012) from a long term view but we are worried about usage of this method in practice. Thanks to the internet we can now track ascents of each route in databases like 8a.nu [3] or in Czech Republic it is lezec.cz [4]. In the case of lezec.cz satisfactory quantity of ascents is publicly available since 2002, some ascents are even older. This data are suitable for analysis especially with the characteristics of climbing route - grade, height and number of bolts. Last two were used to create an index of dangerousness. Length of the possible fall probably influences the fear of the climber thus his decision to climb or not to climb the route.

"Kozel" climbing area in Chřiby hills and "Indie" in Moravian Karst were chosen as model rock faces. Both are quite frequently visited, well bolted and they have full spectrum of grades - in case of Kozel up to 9+ UIAA, in case of Indie up to 11 UIAA. Both are nature conservation representatives. Kozel from large coarse grain Quartz Glauconite sandstones is protected by state of National Monument and Indie from Devonien and Rif limestones is part of Protected Landscape Area Moravian Karst and Natural Reservation "Sloupsko-Šošůvské jeskyně".

Results

The original thought was to analyse these numbers by regression analysis. Linear, polynomial and exponential regression provided R-squared around 0,3-0,5. Making decisions from these models would cause maybe more harm than usage. Each route is too specific to generalize and compute some universal equation. The characteristics showed to be more like specification of the climbing sector e.g. Indie is well bolted, the average distance between bolts is 3,64 m with some extremes (old, historical routes).

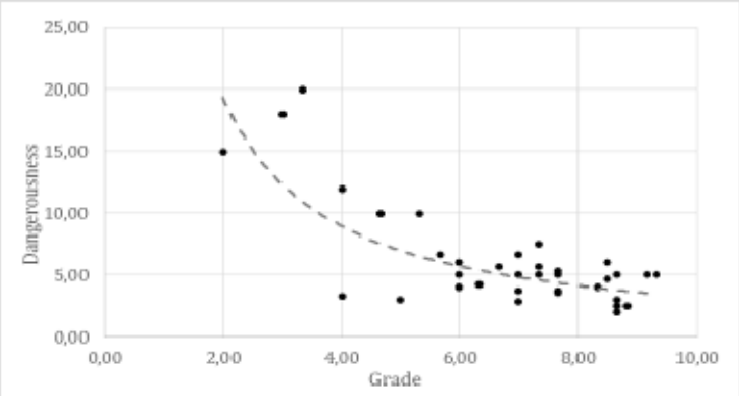

Fig. 2: Dangerousness vs. grade - Kozel

Rock face Indie is almost the same situation as above figure (Kozel), but the trend in Moravian Karst is to bolt safely almost everything, even easier routes. We can observe a trend, where harder routes are better bolted than the easier ones (Fig. 2). It is logical, climbers will mostly accept higher risk in easier routes, where the chances of fall are smaller (except routes with high risk, see Fig. 3 and 4).

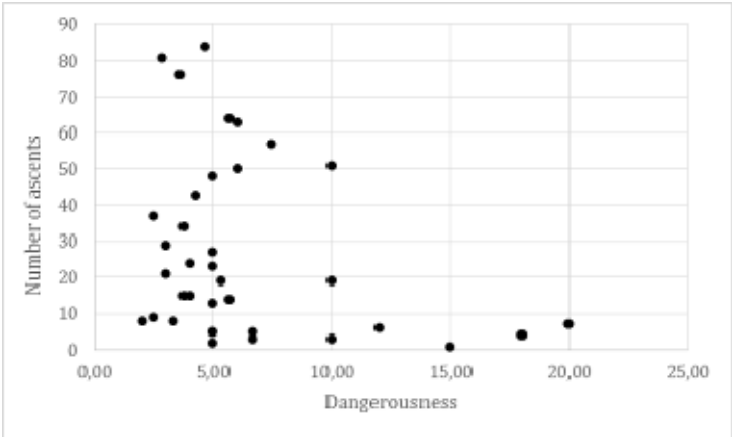

Fig. 3: Dangerousness vs. Number of ascents – Kozel

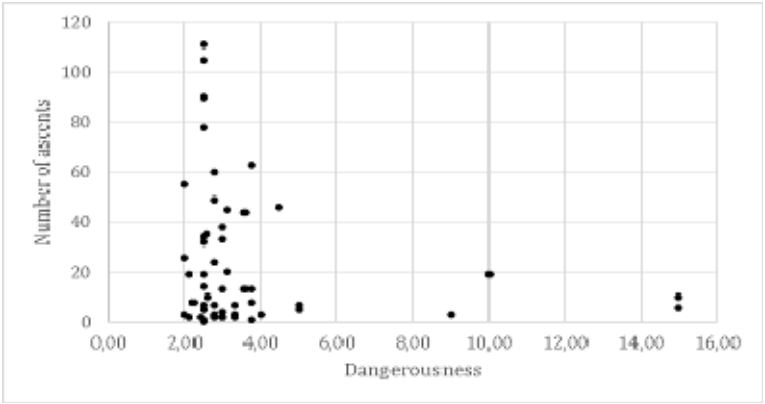

Fig. 4: Dangerousness vs. Number of ascenst – Indie

The queen of decision making – grade. The relationship is surprisingly weak. But in general - easier and harder routes are less often climbed than routes with middle grade.

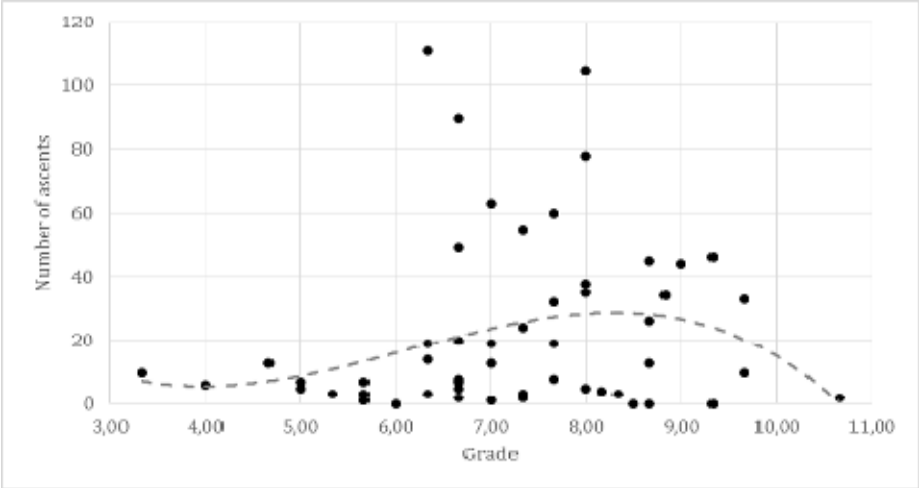

Fig. 5: Number of ascents vs. grade - Indie

Discussion

We have to say some notes about the source of data. First, we assume that number of ascents in database is somehow in correlation with reality, but despite its potential being a sample, the level of approximation is unknown, because the sample is not subjected to sampling design or to organized research. Second, the act of adding an ascent to database is accompanied with certain paradigm:

- Submitting the ascent is mostly one time activity. But the route is climbed by the same climber more times than once during years.

- Thus more powerful climbers will submit the easy ascent once but they will climb it next visit again before climbing harder route.
- Easier routes are climbed by one try (On-Sight, Flash) or small amount of tries, but harder routes are subjected to training in terms of PP or RP style (one ascent but many tries). Here are some examples [4]:
    - On Kozel - “Devizový příslib” (grade 9- UIAA):
      11% of ascents OS and Flash, 89% of ascents PP, RP…
    - Pieta (grade 5- UIAA):
      81% of ascents OS, the rest PP, RP…
- So the second one was obviously under the climbers maximum, next time climber can climb it to get warm, 7before he will try the first one.
- What about the middle grade? Strong climbers will send it OS, but weak climber will have to train it.
    - Mazácká (grade 7- UIAA):
      Ratio between OS-like and PP-like ascents is 55:45
    - So easy routes have fewer ascents in database but hard routes are climbed many times to get one ascent submitted. Real usage thus correspond approximately with the data and it can look somehow like this:

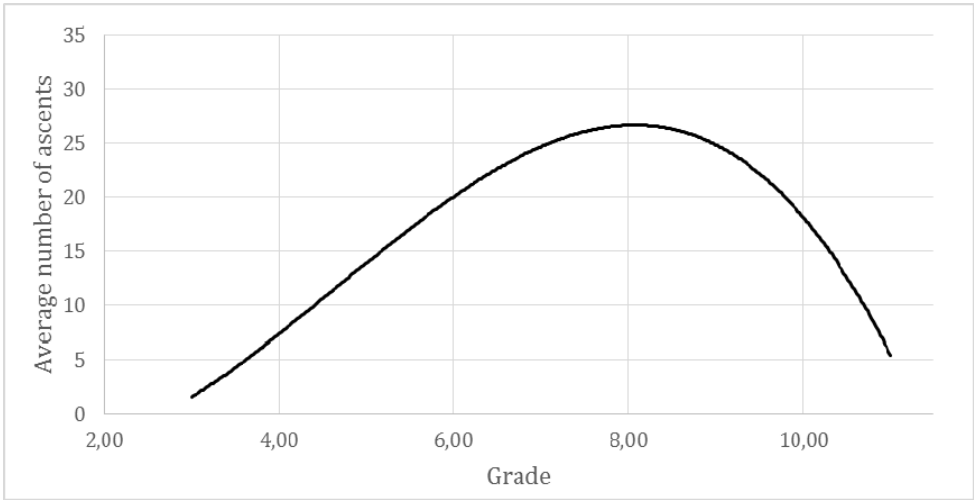

Fig. 6: Rough approximation about how the real usage of ecosystem can look like for Indie, it corresponds with the number of ascents

- Besides these notes, there is one big disadvantage. The internet database will never be a good resource of data because of lack of discipline and unknown process of decision done by climbers. Some of them published their ascents only for routes with high grade or those they are proud of. I have seen ascents submitted even twice (first as PP, then as RP). So, having all this notes on mind, there are these characteristics: number of ascents, number of bolts, length of the route and grade of the route which are possibly in some relationship. (Only ascents are from the internet database, the others are from reality.)

Classical statistics methods are good for classical earth sciences like biology, chemistry and so on… The Economist, statistician and philosopher Nicolas Nassim Taleb says that there are two worlds to study by statistics – Mediocristan and Extremistan (2007). The main thought is – were extremes can be huge and have large influence on the average (like wealth of 100 people were Bill Gates will blew up the average) the dataset belongs to extremistan – than classical Gaussian probability based statistics should not be used. We think that this is our case. Number of ascents can be infinite and have huge influence on the average. (It is very probable that on the rock face there is some “star” route which everyone would like to climb.)
Simply told, assumptions are not met here. He recommends using Mandelbrotian distribution. But why we should use such mathematics? Conclusions are intuitive and most of them are result of common sense, only supported by data. (Classical definition of sociology: scientific approach to “beer themes”).

The data have one additional attribute - date of the ascent. From short-term view we can observe trend in dynamics of climbing in each area. Shame we don't have statistics about the usage of the server, but the providers didn't respond to any email or application.

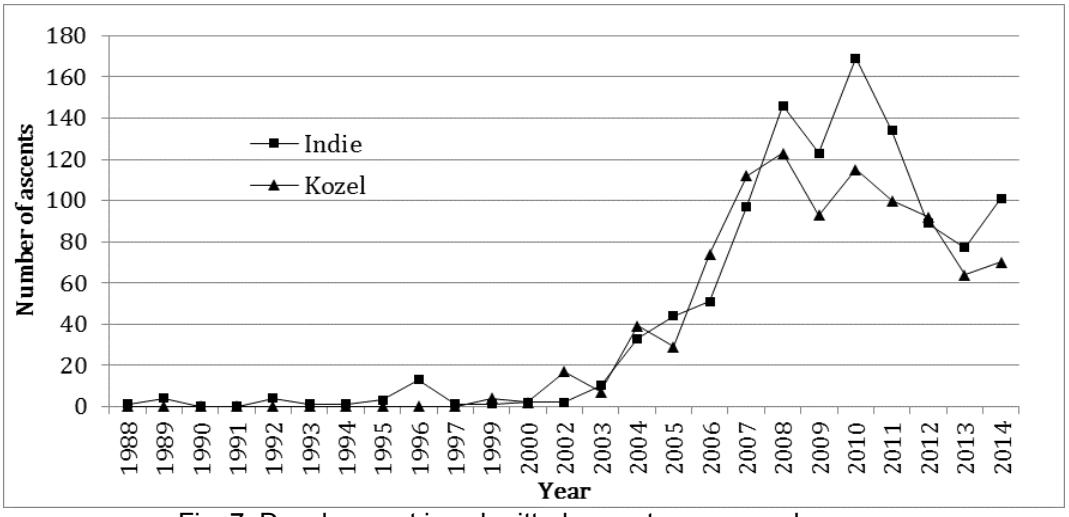

Fig. 7: Development in submitted ascents on server lezec.cz

There is obvious correlation (*corr=0.96, spear.=0,88*), but how far is the correlation caused by the traffic of server we don't know. We assume that the traffic of sever was main driver of submitted ascents during period 2002-2007, since than it can be some other factor (weather, economic situation…).

Conclusion

Management of rock climbing areas is based on regulations based on nature conservation in general, climbing rules mainly solving the bolting problem and the tradition of the sport and somewhere between climbers alone, obeying or disobeying these rules. There is no systematic exploration of the activity and nobody is concerned about the development of rock climbing in present. The management lives its own life and managers should learn how to understand the climber's preferences in each climbing sector. They should be able to say where the routes are "overbolted" or where the climbers tend to gather. This is maybe not a problem for small areas but in large areas where managers can't have a good overview about the situation it is essential.

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Souhrn
Na bouřlivý rozvoj sportovního lezení v posledních letech reagoval management skalních oblastí (orgány ochrany přírody, horolezecké kluby) vydáváním různých metodik a návštěvních řádů. Snahou je tak vytvoření trvale udržitelného rozvoje skalních oblastí s omezením negativních dopadů lezecké aktivity na biotopy hostící vzácné druhy rostlin a živočichů. Porozumění chování lezce a jeho preferencím je klíčem k úspěšnému směřování managementu. Díky internetovým databázím skalních cest je možné vysledovat dle počtu zapsaných přelezů, které cesty jsou vystaveny zvýšené rekreační zátěži a jak je počet přelezů ovlivněn charakterem lezeckého sektoru. Indie v Moravském Krasu je například velmi dobře odjištěným sektorem, kde se průměrná vzdálenost mezi jištěními pohybuje kolem 3,6 m. Průměr zvyšují některé extrémy v podobě starších cest, které mají nižší počty přelezů. Klasifikace je pro většinu lezců rozhodujícím kritériem. V obecné míře můžeme říci, že nejvíce lezené jsou cesty střední obtížnosti, které jsou lezeny výkonnými lezci tzv. „na rozlez" a zároveň jsou nacvičovány lezci méně výkonnými. Dle data přelezu lze usoudit, jak může vypadat návštěvnost v jednotlivých sektorech, ačkoliv nelze říci, jaký vliv má návštěvnost webu. Analýzou oblíbenosti cest lze pak ve větších oblastech určit problémová místa, na která se management může soustředit.

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CHINA CLAY PITS – FILL UP THEM OR FULFIL THEIR TOURIST POTENTIAL?

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Abstract
The impact of excavation on entire landscape is negative. Without any doubts, stone quarries, sand pits or spoil heaps damage the original land. Nevertheless, many studies proved also potential of these sites to enhance geodiversity and biodiversity, depending on many factors as size of the pit, raw material and technology of exploitation, type of restoration and management applied. Restoration can be led also in the way of future tourist interest. China clay pits are specific for their colour, chemism and other attributes. This paper presents some examples of china clay pit restoration from abroad with the emphasis on their tourist use and states future perspective for possible restoration and tourist potential of china clay pits in the Czech Republic.

Key words: kaolin pit, tourist activities, natural restoration

Introduction

Surface mining in open quarries and subsequent reclamation processes affect landscape in many ways, in most cases negative (Hütl & Schneider 1998; Hütl & Bradshaw 2001). When excavation is finished, different methods to restore the site can be applied, following Czech legislation. In the Czech Republic, traditionally forestry, agricultural or hydrotechnical restoration practises are refered (Štýs 1981).

China clay pits represent a specific environment by both its chemical and physical parameters. there were 70 caolinit deposits registered in the Czech Republic in 2012, with only 15 of them being exploited (Starý 2013), mainly in the region of Karlovy Vary and Plzeň. The china clay is exploited by surface mining in storey quarries, nevertheless, also underground mines were open in the past (Nevřeň in Plzeň district, Hosín close to České Budějovice). Because of the technology of china clay progressive exploitation, working districts are opened for many decades. This fact leads to the natural succession of vegetation in the abandoned sections of the quarries. Abandoned parts of china clay pits often attract local tourists by its specific beauty and also by their blue water bodies, which often fill the bottoms. However, purposeful after-mining restoration enhancing tourist potential and value is rather seldom in the Czech Republic and the traditional agricultural and forestry reclamation prevail, even though the experience from abroad presents different services which could be provided by these specific sites.

Fig. 1: China clay open pit Chlumčany – according to the restoration plan it will be filled up (author: Botková, 2013)

Fig. 2: China clay open pit Otovice – is there better future use then refilling and cultivation? (author: Botková, 2014)

China Clay pits in Cornwall

The area of Cornwall, the United Kingdom, and the West Devon Mining Landscape were declared a World Heritage Site by UNESCO in 2006, especially for its history in tin and copper mining. The china clay deposits in Cornwall were discovered in 1746. 120 million tons of china clay have been extracted since this time, but it is estimated that that there are still reserves which will last at least another hundred years. There are several potential environmental impacts during China Clay

extraction. The most obvious is the visual impact of the open pit workings and their associated waste tips (there is 9 tons of waste in the production of 1 ton of china clay - although some of the “waste” is of commercial value). Of the proportion of worked land for china clay, 87% has provision for reclamation. Reclamation should include steps taken to bring the land to a required standard for agricultural, forestry and amenity uses. For Cornwall this is mainly for amenity use, the most famous being the Eden Project in Bodelva (Cornwall Field Course 2015). The Project's purpose is to demonstrate the importance of plants to people and to promote sustainable use of plant resources. Located in a former china clay quarry, the Project has restored the landscape and built two indoor biomes under large geodesic structures: a five acre rainforest and a one acre warm temperate biome (Prance 2002).
Another good example of what can be done to return disused pits to beneficial use is provided by the Wheal Martin China Clay Heritage Centre at Carthew. The Museum of china clay site includes 2 old clay works. The Wheal Martyn Nature Trail shows how wildlife can thrive in an altered landscape and how quickly nature can take over when human activity ceases. It includes habitats ranging from heathland to mature beech woods, most of which were once bare industrial scars (Brook 2015).
Hydrological relandscaping where public and nature interests go hand in hand can be presented by the Park Pit restoration. Park Pit and surrounding land, on Bodmin Moor in Cornwall, was bought by the water company in 2007 and was described by ecologists at the time as a "moonscape of waste sand and mica." South West Water connected the lake to nearby water treatment works to supply customers in Cornwall. It also entered into an agreement with the former owners, mining company Imerys, to manage the land as an exemplar of post-industrial restoration. Park Pit was transformed from a derelict china clay site to a public water supply and nature-rich landscape and the 125 hectares of land around the reservoir have been officially designated a County Wildlife Site. Since the initial reseeding the vegetation has continued to develop naturally and ecologists surveying the land have found two species which are very rare in Cornwall. Park Pit is only one of two sites in Cornwall for Marsh Clubmoss (*Lycopodiella inundata*), a nationally threatened species. Stag's-horn Clubmoss (*Lycopodium clavatum*) is common in northern parts of the British Isles but was thought to be extinct in Cornwal (South West Water 2012).

Conclusion

Restoration aiming to the field, forest or water body will be always the most common method applied. Three examples of china clay restoration projects from the United Kingdom show broader view and possibilities for restoration. The most important factor during the restoration planning is an individual approach, which is more expensive and time-consuming but it can lead to better use of the special opportunity which abandoned open pit definetely represent, especially in the highly populated Central Europe. Therefore owners and responsible administratives should be encouraged to suggest and choose the more creative solutions for the sake of both nature and humans.

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Souhrn
Povrchová těžba znamená snad vždy negativní zásah do krajiny. Tento zásah bývá zahlazován následnou rekultivací těžebního prostoru a okolí. Mezi tradiční metody patří lesnická, zemědělská a hydrotechnická rekultivace. Cílem je většinou umožnění opětovného hospodářského využití prostoru, i když v některých případech převáží jiné funkce, například krajinářsko-ochranářská. Jedním z cílů rekultivace může být také zvýšení rekreační atraktivity území. Tento článek je zaměřen na specifický příklad těžby kaolinu. Kaolín se v České republice dobývá především v západních Čechách v okolí Karlových Varů a Plzně. I přesto, že je Česká republika významných producentem kaolínu vysoké kvality, těžených ložisek není mnoho. V roce 2012 byl kaolín aktivně těžen na 15 lokalitách (Starý 2013). Po odtěžení ložiska se většina jam rekultivuje na zemědělské a lesní pozemky, což je dáno jak tradicí, tak současným nastavením legislativy. Zkušenosti ze zahraničí však ukazují, že se k rekultivaci dá přistupovat kreativněji a vzniklý specifický prostor využít například ke zvýšení rekreační zajímavosti území. Příspěvek prezentuje oblast Cornwallu ve Velké Británii, kde je těžba kaolinu významným krajinotvorným a sociálním faktorem. Tři realizované projekty (Eden Project, Wheal Martin China Clay Heritage Centre a Park Pit) nastiňují možnosti, které kaolínové jámy představují.

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IMPLEMENTATION OF THE MODIFIED HESSEN METHOD IN GIS AS TOOL FOR SPATIAL DECISION SUPPORT IN THE LANDSCAPE

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Abstract
Economic assessment of the landscape draws on a modified Hessen biotope assessment method adjusted to the conditions of the Czech Republic (Seják, Dejmal et al., 2003). The NATURA 2000 map is used as a mainly data source, following efforts to unify the methods of economic valuation of environmental assets within the European Union (Cudlín et al., 2005). For purposes of decision support, the data processing as well as the assessment itself takes place in a GIS environment and is based on implementing a method which enables partial automation, simplification and acceleration of landscape assessment procedures in the GIS environment.
The valuation of the landscape, which is based on characteristics of habitats to be protected and is expressed in crowns, is one of possible tool for quantifying landscape's nonproductive functions (ecosystem services). Valuation landscape, which is based on characteristics of habitats to be protected and is expressed in crowns, is one possible tool for quantifying nonproductive functions (ecosystem services) landscape. Calculated financial value can serve as one of the arguments for nature protection against large intensive recreational / sports activities (golf courses, motocross, ski resorts ...)

Key words: expertise, landscape, valuation, Natura 2000

Introduction

The modified Hessen biotope assessment method was designed in the Czech Environment Institute in 2001-2003 and draws on the principle of the environmental assessment method used in Hesse, Germany. Its key characteristic is a two-level assessment which encompasses an expert relative assessment of the environmental characteristics of given types of landscape (in points) and assigning specific financial sums to individual points. Owing to the fact that the sums are specified based on costs incurred in revitalization projects, the method is a combination of the expert and cost methods (Seják, Dejmal et al., 2003). The method assesses biotope types according to standard typology used in the Czech Republic. Natural and close-to-nature types were adopted from the NATURA 2000 system, with the exception of aquatic biotopes. These were expanded with the objective of rendering their value, which is not conditioned by the occurrence of macrophytic vegetation. For the purposes of the method, the remotely natural and alien-to-nature biotopes were newly defined (53 types instead of the 14 defined by NATURA 2000). As a result, a total of 192 biotope types are distinguished. The relative ecological value was calculated for every type, its determination being based on eight characteristics evaluated by one to six points each.

The calculation of a given biotope type value (formula 1) is a sum of point values of the first four characteristics (environmental) multiplied by the sum of the other four characteristics (rareness or vulnerability). The result is related to the maximum number of points (576), which would be achieved if all characteristics were assigned the value of six points (Cudlín et al., 2005).

$$[(1.+2.+3.+4.)*(5.+6.+7.+8.)/576]*100 = \text{biotope type value} \quad (1)$$

The resulting table gives a clear outline of biotopes and their relative point values. Due to the fact that the lowest value of a biotope assessed by this method is 3 points, this value was changed to 0 points in biotope types fully devoid of any natural properties.
The assessment of biotope type is followed by individual assessment of specific biotopes (in a given time and space). It is conducted by a field survey and used to reduce (exceptionally also to increase) the basic point values in cases when the biotope does not correspond to the description of the given biotope as provided by the Catalogue of Biotopes of the Czech Republic (Chytrý et al, 2001 In Cudlín et al., 2005). Corrections of point values use a coefficient determined on the basis of six auxiliary criteria.
The calculation of the financial value of a given area requires the assignment of a specific sum to a point. This point value was determined through an analysis of restoration projects implemented under the Landscape Management Programme and the River System Restoration Programme. This price,

which expresses the average costs required for increasing the value of 1 m^2 by one point under the 136 studied projects, amounted to CZK 12.36 in 2003 (Seják, Dejmal et al., 2003). When determining the value of a given area, the individual biotope types and their surface areas are determined, their point values identified and multiplied by the correction coefficient of individual assessment, multiplied by the area of individual biotopes and the financial value of one point.

Materials and methods

The methodology, which uses the layer of biotope mapping in the Czech Republic according to the NATURA 2000 methodology as input data, draws on the work of Cudlín et al. (2005). The process of biotope valuation is divided into four steps.

I. Assigning point value to a biotope.

Firstly, a new field for entering the point value of biotopes needs to be created (see fig. 1). Before entering the values, types of remotely natural and alien-to-nature biotopes must be identified additionally (the so-called "X biotopes") according to the Hessen method. This step is required because the Hessen method identifies 53 types of X biotopes, while NATURA 2000 only 14. The classification of X biotopes into biotope types according to NATURA 2000 is provided by Seják, Dejmal et al. (2003). Owing to the fact that the conversion ratio is not a simple 1:1, this step needs to be consulted with the input layer mapper or with a landscape ecologist. The new field is then filled according to the List of Biotopes of the Czech Republic published in the Valuing and Pricing of Biotopes in the Czech Republic (Seják, Dejmal et al., 2003, pp. 215 – 219).

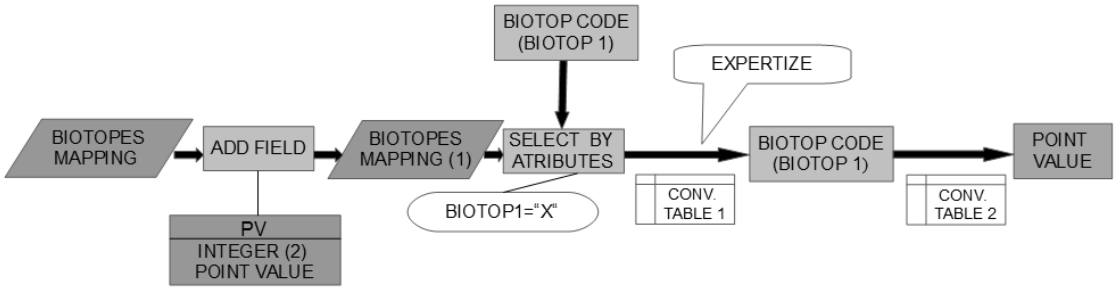

Fig. 1: Assigning point value to a biotope

II. Calculation of the individual assessment coefficient.

The calculation of the individual assessment coefficient according to first procedure (Fig. 2) is fast and simple. It involves assigning a coefficient value based on the combination of values of attributes describing representativeness and naturalness. The relevant tables for assessing individual combinations are provided by Seják, Dejmal et al. (2003). Again, problems may arise in relation to X biotopes. If the coefficient value cannot be determined from the input layer, then the given segments are assigned value 1.

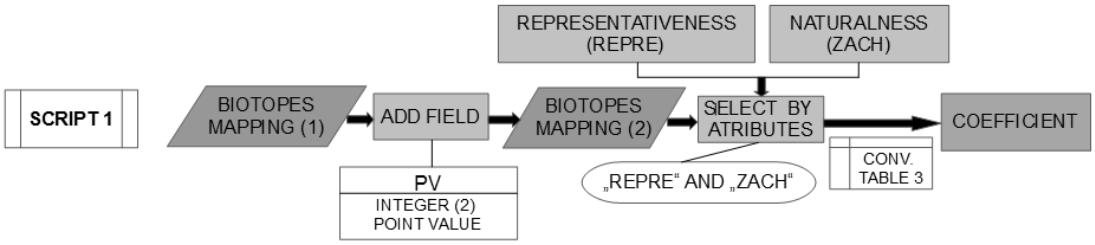

Fig. 2: Calculation of the individual assessment coefficient

III. Calculation of the individual segment value.
The final calculation requires information about the area, which can be retrieved from the dataset using operation Calculate Area. The resulting price of individual segments is then obtained through a product of attribute values of "point value", "coefficient", "area" and price of a point related to 1 m^2, whereby a particular point value is obtained through multiplication of the biotope point value and the correction coefficient. Consequent multiplication by the price will yield the price of individual biotopes and upon multiplication by the area, the specific segment price will be obtained (Fig. 3).

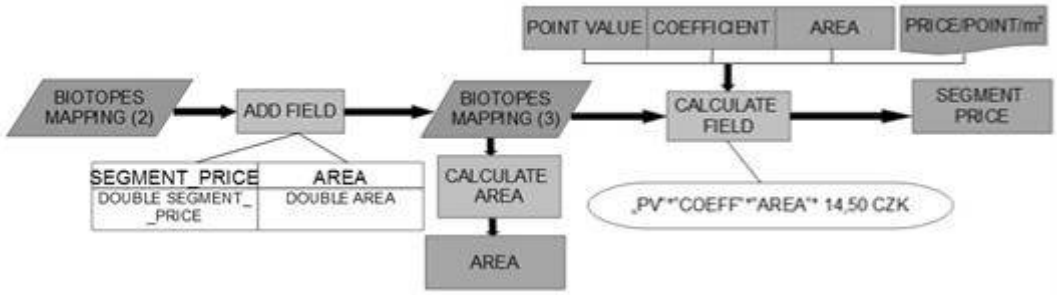

Fig. 3: Calculation of the individual segment value

IV. Visualization of results.
To visualize results better, it is convenient to express the price of segments relative to m^2. This is achieved when the resulting segment price is divided by
the area (Fig. 4).

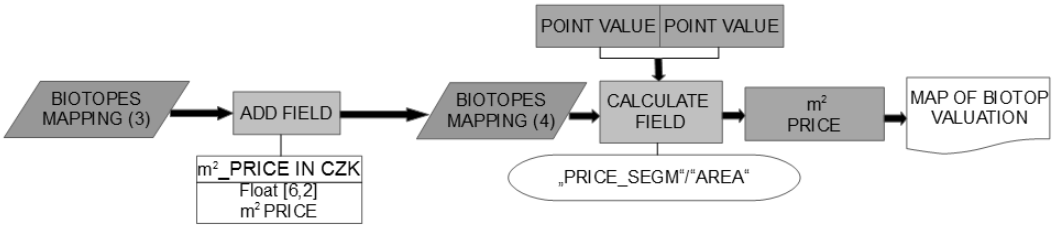

Fig. 4: Visualization of results

Results
This GIS approach has been implemented into the our tool for spatial decision support (Pechanec, Brus, 2012). Practically was tested at several locations in the Trkmanky basin (south-eastern Moravia). The calculation was applied to the Kobylí and Ždánice model sites. Segment price expresses the average costs required for increasing the value of 1 m^2 by 1 ecological point (Tab. 1).

Tab.1: Representation of of price categories

Value (CZK/m^2)	Ždánice		Kobylí	
	Area (ha)	%	Area (ha)	%
< 400	439,02	37	11,29	16
401–500	199,78	17	13,71	20
501–600	191,88	16	5,85	8
601–700	188,65	16	10,23	15
> 701	167,75	14	29,21	42

More highly valued landscape segments, falling into the category of 701 and above CZK/m^2, cover 42 % of the area of the Kobylí model site, although they encompass only three, yet vast segments in the centre of the evaluated site. In the Ždánice model site, on the other hand, most landscape segments fall into the category of up to 400 CZK/m2, with the remaining value segments distributed evenly throughout the site (Fig. 5).

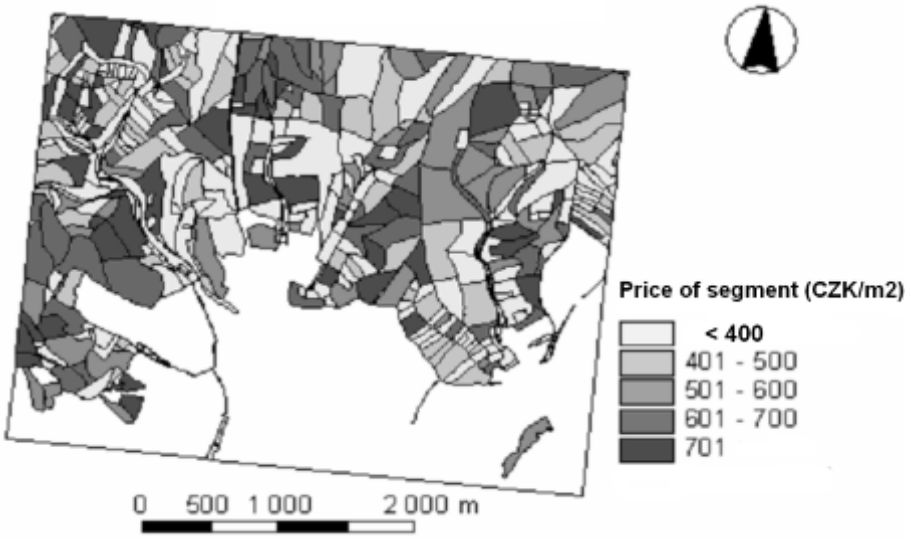

Fig. 5: Price of biotopes in Ždánice model site.

Discussion

Relation to the NATURA 2000 method. The NATURA 2000 method encompasses its own individual biotope assessment. Since the objectives of both assessments are not identical, the assessment criteria cannot overlap fully. Individual biotope assessment according to NATURA 2000 assesses representativeness (expressed by letter scale A, B, C, D), naturalness (A, B, C) and in forest biotopes also the age structure (P, Q, R, S). This approach is motivated primarily by the nature conservation perspective (Guth, 2002 In Cudlín et al., 2005) and as such, apart from the biotope quality itself, evaluates criteria which do not feature in the Hessen method. These include management, outlooks and possibilities of restoration. The Hessen biotope assessment method, on the other hand, focuses primarily on the current value of a biotope (to what degree the given biotope corresponds to its type) and its criteria also focus on characteristics which NATURA 2000 does not deal with, such as maturity, the relation of the biotope to the ecological stability of the surrounding landscape and its significance with respect to the broader regional context. There are two approaches towards conversion between these two methods. The first yields a resulting numerical coefficient of individual assessment based on the combination of the values of representativeness and naturalness. This procedure is fast and simple and draws on the assumption that although the assessment criteria of NATURA 2000 and the Hessen method are not identical, both assessment methods provide comparable information on biotope quality. The second approach tries to infer coefficients of individual assessment criteria of the Hessen method from all the available data provided by the NATURA 2000 method. This approach is more time-consuming and as mentioned above, some criteria cannot be inferred from the NATURA 2000 method, as the two assessment methods do not overlap completely (Cudlín et al., 2005).

Conclusion

Economic assessment of the landscape draws on a modified Hessen biotope assessment method adjusted to the conditions of the Czech Republic (Seják, Dejmal et al., 2003). The NATURA 2000 map is used as a mainly data source, following efforts to unify the methods of economic valuation of environmental assets within the European Union (Cudlín et al., 2005).

For spatial decision support, the data processing as well as the assessment itself takes place in a GIS environment and is based on implementing a method which enables partial automation, simplification and acceleration of landscape assessment procedures in the GIS environment.

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Souhrn
Ocenění krajiny, která je založena na vlastnostech biotopů, které je třeba chránit a je vyjádřen v korunách, je jedním z možných nástrojů pro vyčíslení mimoprodukční funkce (ekosystémové služby) krajiny. Spočtená finanční hodnota může sloužit jako jeden z argumentů ochranu přírody proti velkým intenzivním rekreačním / sportovním aktivitám (golfová hřiště, motokros...)

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IMPLEMENTING RISK MANAGEMENT PRINCIPLES TO MTB TRAIL INFRASTRUCTURE IN THE CZECH REPUBLIC

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Abstract
Risk management is often used as an excuse to stop MTB trail initiatives in the Czech Republic. Yet land managers in general are not acquainted with the fact that risks and hazards in outdoor recreation infrastructure can be managed with the right set of risk management tools. Therefore rather than a bureaucratic nuisance, risk management measures should be perceived as an opportunity to deliver more sustainable trails. The paper summarizes measures recommended to be taken in a trail relevant risk management program. These measures should rely on having a trail design and construction standards, establishing risk management team, designing and delivering emergency localization system, providing conditions for visitors to take informed decisions, warning against hazards, consistent monitoring and inspections of trails, and providing trail updates and closures information. When risk management gets broken down into these practical measures, it can be implemented simply and without substantial costs.

Key words: outdoor recreation infrastructure, managment program

Social fact or an excuse strategy

Land managers and land owners today find themselves in a position where they feel anxious of the effect of heightened liability introduced by the trend. On the other hand public land managers and/or owners in Central Eastern European countries - and in the Czech Republic in particular - have not yet widely adopted the practices that have been developed in the U.S.A. and the UK to manage risks and liability and therefore mitigate the negative effects of liability society on public land management and recreation. Often land managers are in fact unaware that risk and liability can be managed at all.
There is a tendency to turn down MTB trail projects on the basis of problems they are deemed to bring for liability and management fields. Yet up-to-date risk management procedures for trail infrastructure can help to solve most of the problems land managers are affraid off.

Founding principles of risk management

Although laws in various European countries differ it is safe to argue that they function on similar principles as in the Czech Republic where the concepts of safety and risks are at stake. Solutions to risk and safety in outdoor recreation we promote here are therefore relevant not only for Czech conditions but also elsewhere in Europe:

1. There is always some level of duty of care lying with land managers
2. The duty is lowest for undeveloped land and highest for improved land.
3. The duty comes into play in situation where recreation interacts with other land uses and functions. This is most often the case with forestry and agriculture.
4. Trails are both a form of improved land and a form of infrastructure and therefore their provision brings in risk management implications.
5. Land managers generally cater for a land that has been at least to certain extend developed and that serves multiple functions. In any case having a recreational trail (or route) infrastructure placed on this land is a form of development.

New trails – more effective solutions

From practical point of view risk management practices and procedures can be best developed for new formal trail products - a term that Dafydd Davis, a world renown trail designer and theoretician coins for projects of new trail infrastructure that is tightly formalised and managed. Although it is challenging to overcome initial mind-blocks land managers have about "having new trails" in situation where there is anxiety about solving risk management issues, we advise this solution as most effective to establish a template for proactive approach to risk and safety. Alhough not as effectively the principles can also be adopted to existing trails.

Distinctions in risks

It is important to make an analytical distinction. Risk from staying in the outdoors needs to be distinguished from risks inherent to particular outdoor pursuits. While in the first case the dangers are coming from the natural and climatic conditions combined with the potential dangers from land use on

visitors, in the second case the risk lies mainly in the infrastructure for outdoor pursuits (trails, ski tracks, ski slopes etc.) and the ability of participants to master them with their equipment and technique.
Risks and hazards stemming from the forested natural and semi-natural environments, namely the risks of injury from falling trees and branches but also injuries from dangerous climatic events and injuries from wildlife animals are very low. Systematic attempts to manage falling trees risks in the UK have let to the establishment of the practice of active solutions for urban environments and non-intervention for forested environments. Attempts to eliminate those risks in forested areas would lead to removing most if not all trees which would negate the reason for which people visit them in the first place.
While the established best practice for falling tree hazards is non-intervention, the interface between forestry (namely timber harvesting operations) and recreation is subjected to pro-active risk management in the UK. In fact the development of formal trail products (popularly called trail centres) can be perceived as a result of attempts to find a most effective solution for it.

Inherent risks
Risks inherent to particular outdoor recreation activities are part of the reason why people participate in them. According to sport psychology overcoming risks is the substance of certain forms of recreational experience including mountain biking. Navigating along narrow trails demands quick reactions and technical skills that make riding mountain bikes fun. From the point of of risk management it is important to notify the user about the nature of the activity and risks inherent to it so he/she can take an informed decision to participate in it. Failure to do so can be interpreted as a negligence. The principle of informed decision in mountain biking infrastructure has demanded that there are trails with certain recognisable levels of risks. This has lead evolution of various forms of trail grading (and sometimes standards associated with particular grades). To accustom the user to the level of risk inherent in riding mountain bikes on narrow trails, it is a good practice to design trails with consistent levels of difficulty and separate trails from each other depending on their increasing difficulty.

Establishing the standard of care
When establishing the level of reasonable care it is important to take following factors in mind:
- there is a reduced scope for direct management intervention
- excessive stress on safety will damage visitor experience and demand costly modifications of infrastructure
- trail inspection and monitoring can be demanding and expensive. it is necessary to aim to a level that can be maintained consistently over time in respect to financial and human resources
- there are other uses of nature / countryside / landscapes then recreation. Efforts to secure visitors‘ safety should not suppress these uses and functions.

In those countries where pro-active risk management is practiced there are two established solutions:
- managers demonstrate they are behaving as a reasonable person would under similar circumstances
- managers demonstrate they acted according to a defined standard of care. The more formal the product, the higher standard is demanded

Risk management program
To be able to prove any or both of these two land managers and entities involved with trails should break their approach down to a set of particular management measures. The points in following list of these measures are described in later paragraphs:
- Trail design and construction standards
- Risk management team
- Emergency localisation system
- Informed decisions of visitors
- Warn against hazards
- Trail monitoring, inspections and record keeping
- Trail updates and closures

Applying the management measures needs to be balanced. On one hand they should demonstrate sufficient (= reasonable) standard of care on the other hand they should not be so strict it will not be possible to maintain them consistently over time.

Trail design and construction standards
Having a clear standard for design and construction of trails is a fundamental component of trail network. In case of a lawsuit standard can be used to prove that the trail network was designed and constructed in sufficient quality and therefore protect its designers, construction contractors, owners, operators and land management authorities.
In general this principle is carried over from the construction industry where there is planning permission process instituted by state and where authorities judge whether the project meets applicable standards. While it is generally true that for constructing trails some for of planning permission is necessary the official construction standards are too generic to apply them trail construction.
In countries where trail construction is common (U.S.A. and the UK) over the years a good practice evolved that can serve as a basis for creating a project's own standard. In our experience it is advisable to break down trails into several categories based on civil engineering criteria and user difficulty and describe each of them on its own.

Risk management team
In well managed trail projects it become customary to create a risk management team that will be be effective, proactive and systematic. The team usually consist of representatives of project stakeholders. Its work lies in addressing the visitor safety issues on the basis of actual day-to-day experience. The work of the team can be perceived as a demonstration of level and quality of care for visitor safety on behalf of stakeholder organisation.
We advise the team to consist of persons with following competences:

- trail design and management expertise
- trail operator‘s representative
- land owner's representative
- health emergency or mountain rescue representative

Emergency localisation system
The first task of the risk management team should be creating an emergency system for fast localisation of accidents and plan for approach routes for rescue personnel. The plan should be checked and revised at least once a year for changes both in trail and in approach infrastructure. Protocols and change logs need to be kept for record.

Informed decisions of visitors
Informed decision can be defined as such decision that an individual made after learning about all important facts, conditions and circumstances. It is good practice to create opportunity to present visitors with these facts so they can make voluntary informed decision whether or not they will participate in the activity and use the trail infrastructure. By making such willing informed decision visitors take on part of the responsibility for risk inherent in the activity. Informed decision therefore lessen the responsibility of trail operators, providers and owners. The information that should be conveyed is:

- Riding mountain bikes has certain inherent risks and is at person's own safety
- Riding mountain bikes is subjected to access legislation (most often forestry law)
- Visitors decide to use the trails at their own will
- Information about the emergency localisation system
- After this point it is understood that the visitor learnt about the facts, accepts them and agrees with them.

The information is usually presented on the information boards at the official entry zones to the trail system.

Warn against hazards
Even with all the care for the consistency of trails and their correspondence with particular standard there are likely to appear spots which include higher level of hazards or dangers such as road crossings, places with forestry traffic, places with visitors from other user groups, or sudden changes in trail character. Visitors should be warned by signs at such spots.
Yet visitors should also be informed that not all dangerous spots might be signposted. This is impossible to do as the perceived level or risk / hazard varies from person to person. Also some risks are inherent in the activity (of mountain biking) itself.

Trail monitoring, inspections and record keeping
There should be a manual for trail monitoring and inspections. It is advisable that it is created by a trail designer who is knowledgeable of the desired state of trails. The manual should include the definitions of desired state, procedures for inspections and frequency for carrying them. All versions of the manual, former or current should be kept for record.
Trail inspections are usually carried out by the risk management team. The frequency needs to be set realistically so that the operator and the risk management team are able to fulfill it and at the same time it is recognised as sufficient.

Trail updates and closures
The current state of trails is variable depending on the time of the year, weather and forest functions and services (most importantly timber harvesting). Trail operators in cooperation with risk management team should publish trail updates and information about closures. It is advisable to post the information online, on site at trailheads and entry zones and at the beginning of affected trail section. The information should be kept for records.

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Souhrn
Jako důvod pro odmítnutí projektů stezek pro MTB v České republice často bývá uváděna obava z možného zranění uživatelů. Správci krajiny si bohužel většinou nejsou vědomi toho, že ke správě rizik spojených s infrastrukturou pobytu v přírodě existují účinné nástroje. Jejich použití znamená určitou byrokratickou zátěž, avšak zároveň přináší velkou příležitost k tomu, aby mohlo být realizováno více udržitelných stezek jako součást péče o rekreační funkci území. Příspěvek shrnuje doporučené postupy, které by měly být zakomponovány do projektů stezek. Mezi tyto nástroje patří stanovení standardu pro návrh a realizaci sítě stezek, ustanovení týmu pro rizikový management, vytvoření bezpečnostního a záchranného systému, vytvoření nástrojů pro Informované rozhodnutí uživatelů, upozorňování na nebezpečných místech, monitoring, průběžné kontroly, protokolování náprav a upozorňování na aktuální stav, nebezpečí a uzavírky. Pokud je správa rizik rozložena do těchto praktických kroků, může být implementována snadno a bez nadbytečných nákladů.

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IMPORTANT ECONOMIC INDICATORS OF NATIONAL PARK ADMINISTRATIONS IN THE CZECH REPUBLIC

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Abstract
The paper deals with the development of the important economic indicators of the National Park Administrations in the Czech Republic in the basic reference period 2005 – 2012. The selected indicators were personal expenses, cost of services, revenues from sales of product, and revenues from transfers (contribution to activities). The aggregate data were transformed from profit and loss statement of the National Park Administrations. This data are available on the website of the Ministry of Finance of the Czech Republic. In the methodological approach the modelling of time series has been used. Further the calculation of the correlation coefficient and test the significance of the correlation coefficient was calculated. The results are applicable for the actual practice, especially for the Ministry of Environment of the Czech Republic.

Key words: economics, time series, correlation coefficient, national park, recreation

Introduction

Organizations tasked with the management of national parks and protected landscape areas are directly involved in the promotion of a wide range of social functions associated with forests and the landscape as such as well as offering leisure time activities and edification. These organizations are not designed to generate profit: they are primarily tasked with nature conservation and landscape protection, thereby contributing to the improvement of the quality of life as required by society. (Březina, Šafařík, Hlaváčková 2013; upraveno)
Their management is defined by Act No. 218/2000 Coll. on Budgetary Rules and by Act No. 219/2000 Coll., on the Property of the Czech Republic. Their accounting is governed by Decree No. 410/2009 Coll., implementing Act No. 563/1991 Coll., on Accounting.
The aim of the paper is to analyse the development of major economic indicators of National Park Administrations in relation with the most important financial indicator of state non-profit organisations – liquidity (ability to pay) for the reference period 2005 – 2012.

Material and methods

Theoretical Background
The selected economic indicators were the major cost items – personnel costs, service costs, and revenue items – revenues from sales of own products, revenues from transfers (operational grants). All indicators were recalculated to per-hectare values and plotted in line charts.
Materials
Data was taken from the profit and loss statements for the period 2005 – 2012. Data for the years 2005 – 2009 was obtained from the ARIS web portal (data presentation system of the IDB ARIS database). Data for the years 2010 – 2012 was downloaded from the ÚFIS portal. Both information systems are available on the Ministry of Finance´s website. The latest data available on the MF´s portal was for the year 2012.
Methodology
The time series was decomposed to the trend component T which describes development of the time series. The authors used the linear trend function.
Formula for calculation of the linear trend (1)

$$T_t = a_0 + a_1 t$$

Wherein:
a_0, a_1 = are unknown parameters
t = 1,2,….n is the time variable
Formula for calculation of the correlation coefficient (2)

$$R = \sqrt{1 - \frac{\Sigma(y - \hat{y})^2}{\Sigma(y - \bar{y})^2}}$$

Wherein:
y = the measured value of the indicator
$\hat{y}$ = the model value of the indicator
$\bar{y}$ = average of indicator values

The test of the correlation coefficient significance (t_R) was performed by the formula

(3)

$$t_R = \frac{R \cdot \sqrt{n-2}}{\sqrt{1-R^2}}$$

Wherein:
R = the correlation coefficient
n = the number of measurements

The null hypothesis (H0) for this test argues that the correlation between variables is not provable in the base data file. The formula of test criterion of significance of the pair wise correlation coefficient has a Student distribution with (n – 2) degrees of freedom. If $| t_R |> t_{\alpha}, n - 2$ (critical value), then we reject H0 (Drápela 2002). Test results were determined at the significance level α = 0.05, i.e. the reliability of tests is 95%. The actual calculation and graphical representation of results was performed in Microsoft Office Excel 2013.

Results

This part of the paper contains results of the research. The authors calculated correlation coefficients for individual economic indicators and tested the correlation coefficients´ significance (see Tabs. 1, 2, 3, 4). The development of economic indicators of NP Administrations was analysed via linear-trend time series modelling (see Figs. 1, 2, 3, 4).

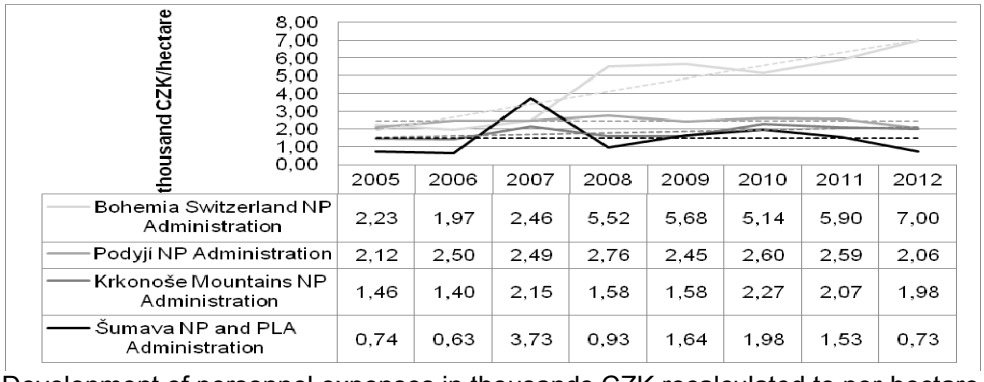
The results of significance testing of the NP Administrations´ personnel costs correlation coefficients are shown in Tab. 1.

Tab. 1: The test of the correlation coefficient significance personal costs NP Administration

NP Administration	The correlation coefficient	The test criterion	The critical value
			2.4469
Bohemian Switzerland NP Administration	0.5474	1.6024	
Podyjí NP Administration	0.1923	0.4800	
Krkonoše Mountains NP Administration	-0.0265	-0.0649	
Šumava NP and PLA Administration	0.5088	1.4476	

Source: own processing

The significance tests did not prove any statistically significant correlation in either of NP Administrations. It is not possible to predict whether the trend in personnel costs will be decreasing or increasing in future years. The development of the personnel costs´ linear trend is shown in Fig. 1.



	2005	2006	2007	2008	2009	2010	2011	2012
Bohemia Switzerland NP Administration	2,23	1,97	2,46	5,52	5,68	5,14	5,90	7,00
Podyji NP Administration	2,12	2,50	2,49	2,76	2,45	2,60	2,59	2,06
Krkonoše Mountains NP Administration	1,46	1,40	2,15	1,58	1,58	2,27	2,07	1,98
Šumava NP and PLA Administration	0,74	0,63	3,73	0,93	1,64	1,98	1,53	0,73

Fig. 1: Development of personnel expenses in thousands CZK recalculated to per-hectare values through a linear trend in the years 2005 – 2012
Source: Ministry of Finance 2014a, b; own processing

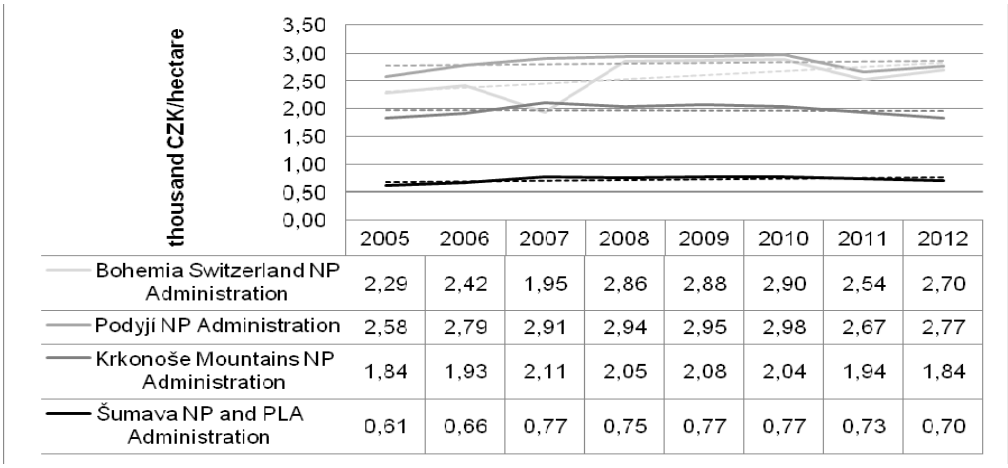
The results of significance testing of the NP Administrations´ service costs correlation coefficients are shown in Tab. 2.

Tab. 2: The test of the correlation coefficient significance costs of service NP Administration

NP Administration	The correlation coefficient	The test criterion	The critical value
			2.4469
Bohemian Switzerland NP Administration	0.9130	5.4819	
Podyjí NP Administration	0.0110	0.0269	
Krkonoše Mountains NP Administration	0.6277	1.9749	
Šumava NP and PLA Administration	-0.0023	-0.0057	

Source: own processing

The significance tests proved a statistically significant correlation in one NP Administration only. The increasing trend in service costs of Bohemian Switzerland NP Administration will probably continue in the coming years. There was no statistically significant dependence identified in other national parks. It is not possible to predict whether the trend in service costs will be decreasing or increasing in future years. The development of the service costs´ linear trend is shown in Fig. 2.



	2005	2006	2007	2008	2009	2010	2011	2012
Bohemia Switzerland NP Administration	2,29	2,42	1,95	2,86	2,88	2,90	2,54	2,70
Podyjí NP Administration	2,58	2,79	2,91	2,94	2,95	2,98	2,67	2,77
Krkonoše Mountains NP Administration	1,84	1,93	2,11	2,05	2,08	2,04	1,94	1,84
Šumava NP and PLA Administration	0,61	0,66	0,77	0,75	0,77	0,77	0,73	0,70

Fig. 2: Development of service costs in thousands CZK recalculated to per-hectare values through a linear trend in the years 2005 – 2012
Source: Ministry of Finance 2014a, b; own processing

The results of significance testing of the NP Administrations´ revenues from sales of own products correlation coefficients are shown in Tab. 3.

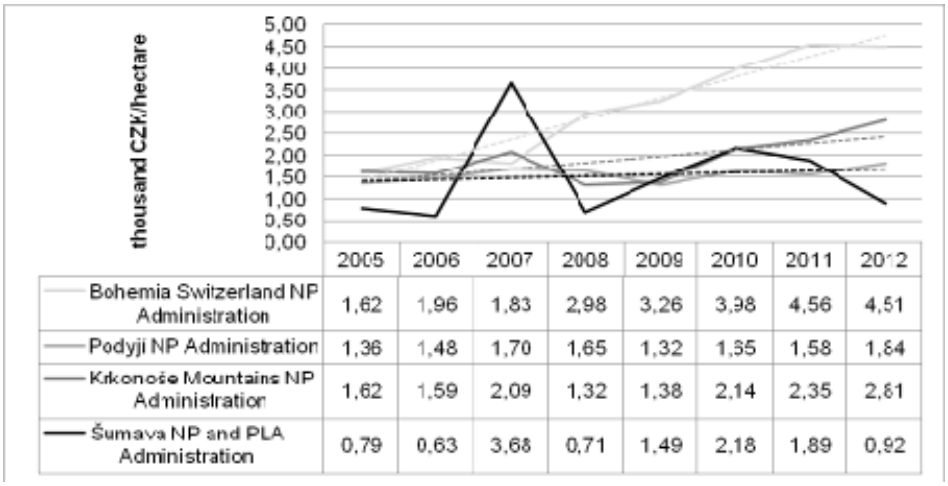
Tab. 3: The test of the correlation coefficient significance revenues from sales of own products NP Administration

NP Administration	The correlation coefficient	The test criterion	The critical value
			2.4469
Bohemian Switzerland NP Administration	0.9732	10.3621	
Podyjí NP Administration	0.5475	1.6026	
Krkonoše Mountains NP Administration	0.6907	2.3393	
Šumava NP and PLA Administration	0.0977	0.2405	

Source: own processing

The significance tests proved a statistically significant correlation in one NP Administration only. The increasing trend in revenues from sales of own products of Bohemian Switzerland NP Administration will probably continue in the coming years. There was no statistically significant dependence identified in other national parks. It is not possible to predict whether the trend in revenues from sales of own

products will be decreasing or increasing in future years. The development of linear trend of the revenues from sales of own products is shown in Fig. 3.



	2005	2006	2007	2008	2009	2010	2011	2012
Bohemia Switzerland NP Administration	1,62	1,96	1,83	2,98	3,26	3,98	4,56	4,51
Podyji NP Administration	1,36	1,48	1,70	1,65	1,32	1,55	1,58	1,64
Krkonoše Mountains NP Administration	1,62	1,59	2,09	1,32	1,38	2,14	2,35	2,61
Šumava NP and PLA Administration	0,79	0,63	3,68	0,71	1,49	2,18	1,89	0,92

Fig. 3: Development of revenues from sales of own products in thousands CZK recalculated to per-hectare values through a linear trend in the years 2005 – 2012
Source: Ministry of Finance 2014a, b; own processing

The results of significance testing of the NP Administrations´ revenues from transfers correlation coefficients are shown in Tab. 4.

Tab. 4: The test of the correlation coefficient significance revenues from transfers NP Administration

NP Administration	The correlation coefficient	The test criterion	The critical value
			2.4469
Bohemian Switzerland NP Administration	0.7141	2.4988	
Podyjí NP Administration	0.7542	2.8136	
Krkonoše Mountains NP Administration	-0.1799	-0.4479	
Šumava NP and PLA Administration	0.1290	0.3186	

Source: own processing

The significance tests proved statistically significant correlations in Bohemian Switzerland NP Administration and Podyjí NP Administration. The increasing trend in operational grants to Bohemian Switzerland NP Administration and Podyjí NP Administration will probably continue in the coming years. There was no statistically significant dependence identified in other national parks. It is not possible to predict whether the trend in operational grants will be decreasing or increasing in future years. The development of the linear trend is shown in Fig. 4.

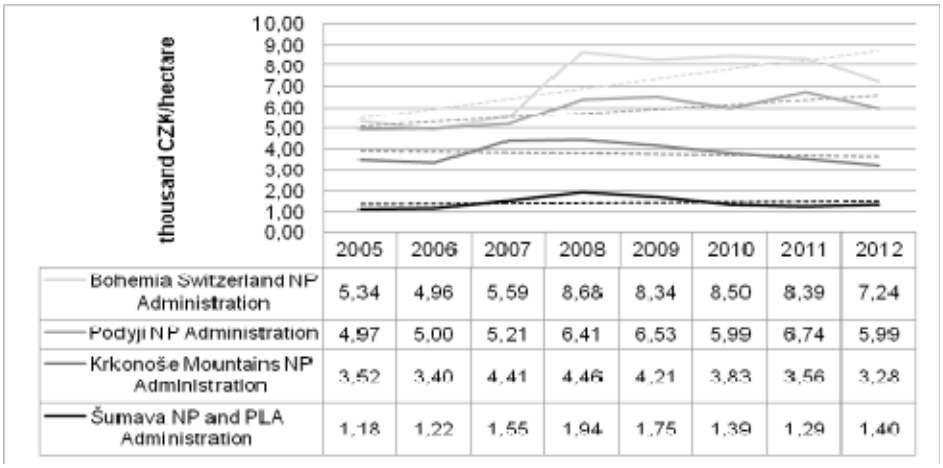
Discussion

The authors studied all available foreign and domestic literature and found that monitoring of development of economically significant variables (service costs, personal expenses, revenues from sales of own products and operational grants) performed by the use of per-hectare values, linear trends, and correlation coefficients have not been carried out so far.

The most consistent trend in major economic indicators was found in Podyjí NP Administration (except for operational grants where the smallest fluctuations were identified in Krkonoše Mountains NP Administration). The biggest differences (i.e. increases or decreases of an indicator´s value) were identified in Bohemian Switzerland NP (personnel costs, operational grants) and Šumava NP and PLA (service costs, revenues from sales of own products). The differences can be seen in Figs. 1, 2, 3, and 4.

The highest personnel costs/area ratio has Podyjí NP Administration – on average CZK 2,826.05 per hectare over 8 years (see Fig. 1). The highest per-hectare service costs (especially the forest production-related services) has Bohemian Switzerland NP Administration – on average CZK 4,486.13 per year (see Fig. 2). The highest per-hectare revenues from sales of own products (especially revenues from timber sales) has Bohemian Switzerland NP Administration – on average CZK

3,087.43 over 8 years (see Fig. 3). The highest operational grants/area ratio has Bohemian Switzerland NP Administration – on average CZK 7,129.90 per hectare over 8 years (see Fig. 4).



	2005	2006	2007	2008	2009	2010	2011	2012
Bohemia Switzerland NP Administration	5,34	4,96	5,59	8,68	8,34	8,50	8,39	7,24
Podyjí NP Administration	4,97	5,00	5,21	6,41	6,53	5,99	6,74	5,99
Krkonoše Mountains NP Administration	3,52	3,40	4,41	4,46	4,21	3,83	3,56	3,28
Šumava NP and PLA Administration	1,18	1,22	1,55	1,94	1,75	1,39	1,29	1,40

Fig. 4: Development of revenues from transfers in thousands CZK recalculated to per-hectare values through a linear trend in the years 2005 – 2012
Source: Ministry of Finance 2014a, b; own processing

Conclusion

The aim of the paper was to analyse the development of major economic indicators of National Park Administrations for the reference period 2005 – 2012. All the above findings about the future development of major economic indicators are based on theoretical calculations. There are many uncontrollable factors (e.g. political situation of the country, socio–economic perception of protected areas, EU strategies) which may cause an unexpected development of these indicators in the following years.

The results are useful in practice mainly for the needs of the Ministry of Environment of the Czech Republic

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Acknowledgement

The paper is part of the work on the Internal Grant Agency project of the Faculty of Forestry and Wood Technology, Mendel University in Brno No. LDF_VT_2015010.

Souhrn

Příspěvek se zabývá vývojem významných ekonomických ukazatelů správ národních parků České republiky za základní referenční období 2005 – 2012. Vybranými ukazateli byly osobní náklady, náklady na služby, výnosy z prodeje vlastních výrobků, výnosy z transferů (příspěvky na činnost). V metodickém postupu bylo využito modelování časových řad, dále byl proveden výpočet korelačního koeficientu a test významnosti korelačního koeficientu. Nejvyrovnanější trend významných

ekonomických ukazatelů správ NP mezi jednotlivými za zkoumané období má Správa NP Podyjí (kromě příspěvku na činnost, kde nejmenší změnu vykazuje Správa KRNAP). Největší rozdíly (tzn. navýšení nebo snížení ukazatele) lze pozorovat v průměru u Správy NP České Švýcarsko (osobní náklady, příspěvek na činnost) a Správy NP a CHKO Šumava (náklady na služby, výnosy z prodeje vlastních výrobků). U Správy NP České Švýcarsko bude pravděpodobně v následujících letech pokračovat trend zvyšování nákladů na služby a trend zvyšování výnosů z prodeje vlastních výrobků. U Správ NP Podyjí a NP České Švýcarsko bude pravděpodobně v následujících letech pokračovat trend zvyšování příspěvku na činnost. U správ ostatních národních parků nebyla významná statistická závislost prokázána. Nelze předpovědět klesající či vzrůstající trend významných ekonomických ukazatelů.

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IN PRAISE OF TREES

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The project of nature trail “In Praise of Trees” is based on the idea of beautifying a forest by sensitive insertion of garden and landscape architecture into the natural forest. The aim is not to transform the nature but based on its principles – natural spaces highlight and carefully create up them. The path is an example of interdisciplinary cooperation between forest engineers and garden and landscape architects. The nature trail is contents of the projects. This path is intended for educational needs of students at Mendel University in Brno and for general public too. Name of nature trail expresses great respect of man to trees. It is forest road which going through meadows and is finished into Arboretum of Křtiny. Thirteen genera are presented on so far implemented meadows. These genera are represented by a wide range of species and cultivars, that creates their richness and diversity. Individual trees were planted as solitary or in small groups. The intention is to create the pleasant environment of green meadows in which individual taxons are incorporated according to site requirements so that they have the opportunity to &ldqu o;show off” their natural habitus and soothed the environment to visitors. In the future the plan is to addition of fourteen spaces (poplar), roads, information boards and furniture.

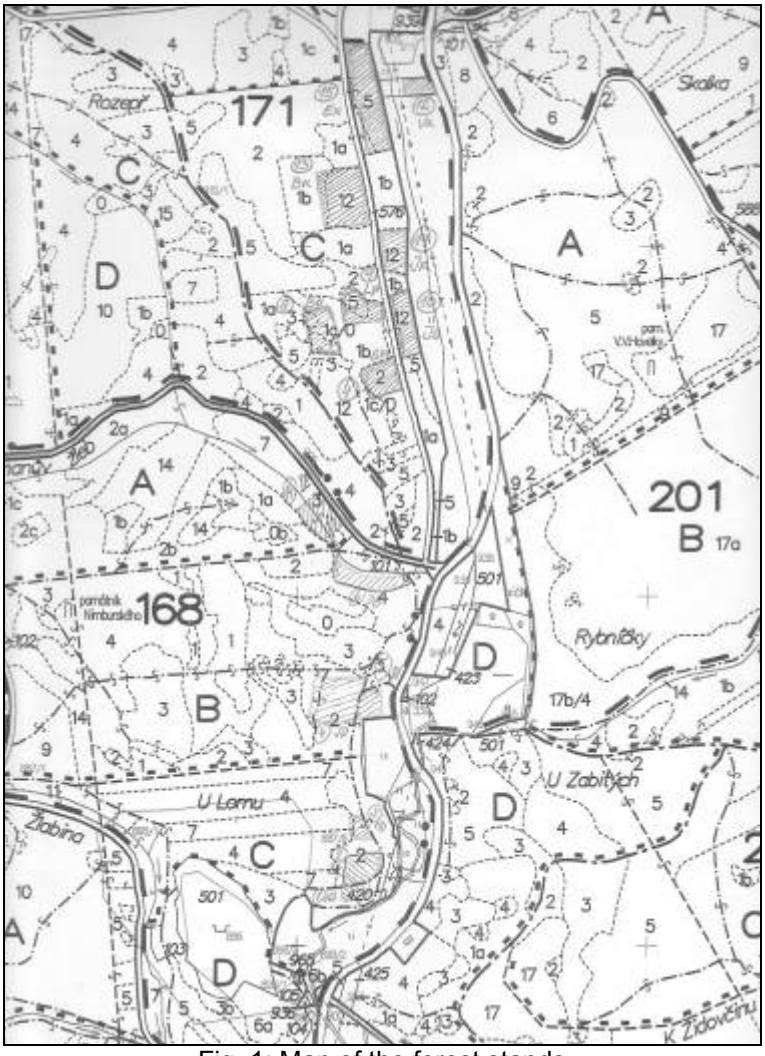

Fig. 1: Map of the forest stands

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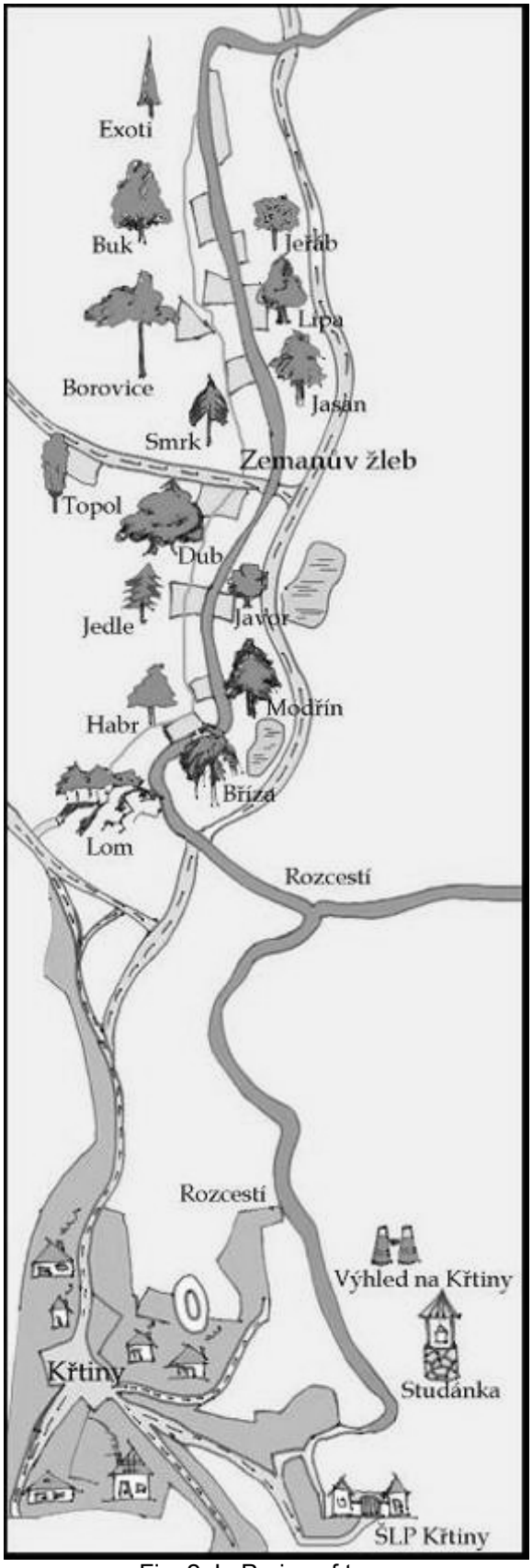

Fig. 2: In Praise of trees

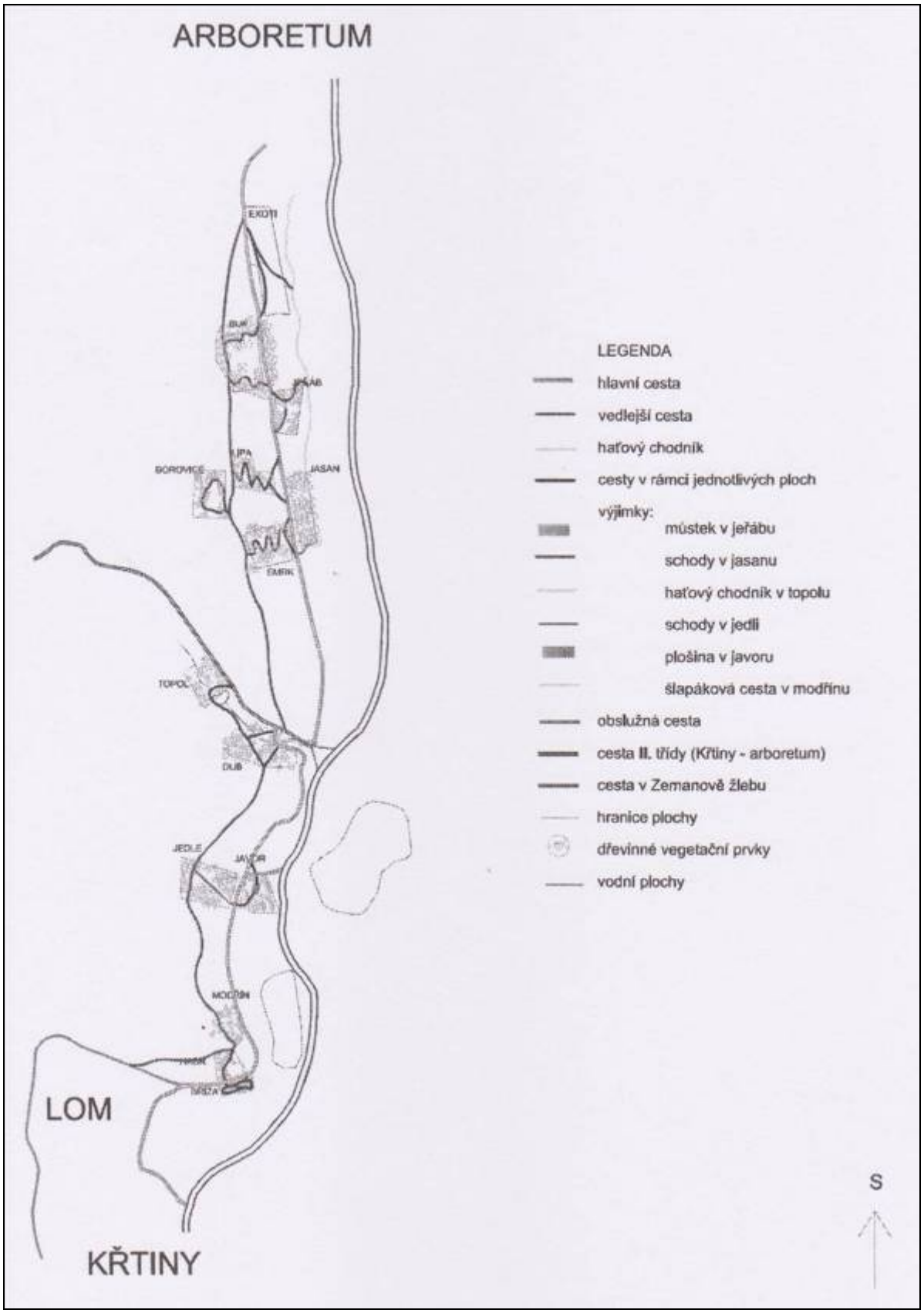

Fig. 3: An overview map of road network

INFLUENCE OF RECREATION ON WATER QUALITY ON THE BÍLÝ STREAM WATERSHED

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Abstract
Osada Šmelcovna situated on the Bílý stream in Svratka watershed is an attractive destination for tourists, cyclists, and is used for recreation purposes. Attendance rate is high season has a negative impact on water quality of the Bílý stream. This is caused by waste water production of this Osada and mainly of the restaurant. The fact lies in an insufficient waste water management and at the same time it is proven by monitoring on the Bílý stream. There have been found high levels of selected water quality indication (COD, total phosphorus, ammonia nitrogen) according to valid Czech legislation. Based on the results of the stream monitoring a solution for waste water treatment for Osada Šmelcovna has been proposed.

Key words: recreation purposes, waste water, tourists, Osada Šmelcovna, monitoring, waste water management

Introduction

There is a substantial improvement in the development of water quality in streams in recent years compared to the end of the last century but there is still some locations in the Czech Republic where there is a discharge of wastewater into some recipients and thus limits set by the applicable legislation of Czech Republic for wastewater discharges into surface waters are exceeded.
This is the case even for the area of interest Osada Šmelcovna, where there is seasonal increased amount of hikers and cyclists, and that the water quality in the Bílý stream consequently changes. Therefore it is necessary to carry out remedies e.g. proposal of natural wastewater treatment. Because of its natural-organic nature it can be included into the landscape while improve water quality in the recipient.

Research Area

Bílý stream springs about 2 km north of the village Skřinářov at an altitude of 605 meters above sea level, near the famous pilgrimage site named "Holy Mountain". The length of the stream is 33.9 km, the watershed area is 113.7 km^2. The average flow is 290 $l.s^{-1}$. The stream flows from the village Skřinářov to the area of villages Osová, Vlkov and Křoví. Then it continued to the Osada Šmelcovna up to Veverská Bítýška.
Part of the valley behind the village Křoví was declared a natural park of the Bílý Stream Valley. At an altitude of 235 above sea level in Veverská Bítýška the Bílý Stream estuary as a right tributary to the river Svratka.
Natural Park Bílý Stream Valley is a protected area with an approximate area of 3,500 hectares. At first, on 1st of January 1978, it was declared as a rest area, then, in 1992, it has become Natural Park. It consists of more than 15 km long White Stream flow in a narrow, wooded, rocky valley. A large percentage of forest here is composed of forests close to nature character. Osada Šmelcovna is a part of the Bílý Stream Valley. The first mention of the settlement dates back to the 13th century, when a mining settlement Podolí was established.
The currant name of the settlement dates since the 1794th. Silver and iron ore mined on Šmelcovna. Iron ore smelted here and it is hence the present name Šmelcovna – from Germen word for smelting "schmelzen".
Osada Šmelcovna is divided into two villages, Maršov and Javůrek. Maršov´s part has just 6 family houses and only one is permanently inhabited. The rest of the settlement (36 houses) belongs to the Javůrek village, four of them are permanently inhabited and 32 just seasonally. About 15 family houses are occupied throughout hole summer season.
Šmelcovna is a major tourist crossroads both for hikers and cyclists. Two tourist signs passes through here, a blue one from Velká Bíteš do Veverská Bítýška and a red one from Maršot to Domařov. This place is very popular one. Both hikers and cyclist have to cross the stream on several swinging footbridges and different logs on the way from Šmelcovna to a Pavlovec Mile. This adrenalin path is very popular route.

Materials and Methods

During the reconnaissance there were chosen five supply points (see the figure 1) and the stream and its surrounding were inspected. The beginning of the area of interest, the first site, is on the border of Křoví village. Next two sites are situated on the area of Osada Šmelcovna. One is above the settlement and the second one in under it. The fourth sampling profile is in the end of Natural Park Bílý Stream Valley area, above the village Veverská Bítýška. The last site is situated in the built-up area of Veverská Bítýška, about 200 m far from confluence of Bílý Stream and Svratka River.

There were made four measurements and sampling on each of this sites during the year 2013 (spring, summer, autumn and winter). There were analyzed following chemical indicators: iron, sulfates, chlorides, COD, total N, total P, nitrates, nitrites, ammonia nitrogen, and phosphates. The results were compared with the environmental quality standards according to Government Regulation No. 61/2003, as amended and with Czech State Standard 75 7221 Classification of surface water quality.

The measurement of selected criteria (pH, conductivity, dissolved oxygen, temperature) is performed in the field using a portable instrument HQd (HACH Company) and particular INTELLICAL probes.

Water samples are taken into the plastic bottles and then they are analyzed in the laboratory of DALE in the spectrophotometer HachLange - DR/4000 according to the concrete methodology for given spectrophotometer. For the analyses of COD, total N, total P and ammonia nitrogen the samples were not filtered but there was necessary to mineralized them. For the rest of indicators - iron, sulfates, chlorides, nitrates, nitrites and phosphates the samples were filtered. Some of them had to be diluted due to high concentrations of its compounds (required indicators), which were higher then possible range determination on the spectrophotometer.

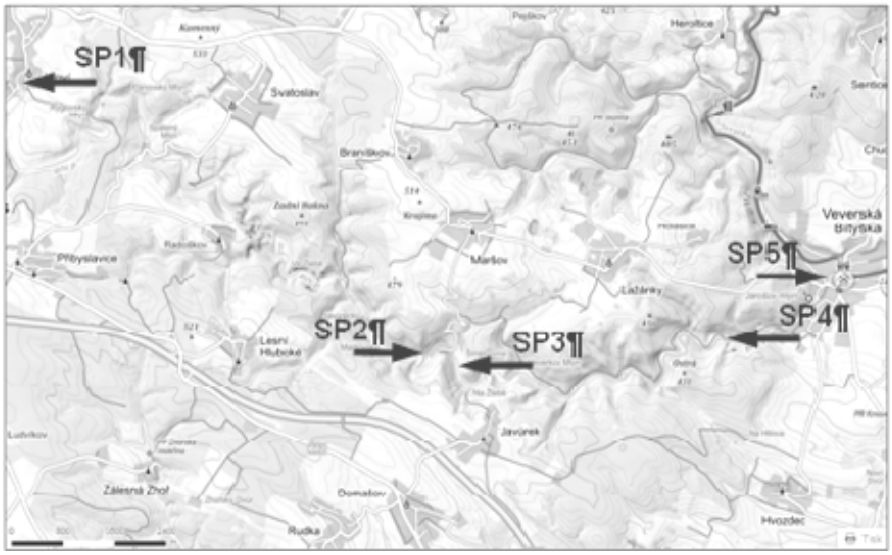

Fig. 1: Picture of the supply points (www.mapy.cz, edited by the author)

Results and Discussion

According to he analyzes and resultes it may be stated, that there are some problematic indicators: nitrogen and phosphorus compounds and COD (see the figure 2) All other evaluated indicators did not crossover the limit value according to the Government Regulation No. 61/2003, as amended. Czech State Standard 75 7221 classifies the stream to the first class according to the concentration of dissolved oxygen and chlorides, according to the sulphates and iron the quality in on the border of first and second class, according to the conductivity to the second class, according to the nitrated nitrogen sometimes to the second and sometimes to the third class and according to the total phosphor and ammonia nitrogen the stream is classified on the border of fourth and fifth class of surface water quality. (see the figure 3, 4)

High concentration of ammonia nitrogen and total phosphorus during the winter time can be caused the year-round occupancy of recreational building thanks to favorable temperatures during the autumn and winter time.

The part of the stream between Osada Šmelcovna and Veverská Bítýška is significantly polluted due recreation because there is no waste water treatment before discharge point. Because of the number of year-round occupied houses (15) and tourism during the spring, summer and autumn a root waste water treatment plant could be a good possibility. It has natural character while is able to respond to shock loading. Root WWTP (see the figure 5) as proposed consists of mechanical cleaning stage -

screens, grit chamber and settling tank, and of biological one, which consist of two fields with horizontal surface water flow. Total area of these fields is around 480 m^2 according to the amount of population equivalent. There are lot number 908/2, 908/1 and 1297 which are suitable for establishing of root WWTP after purchase from landowners and removing parcels of agricultural land.
Regular inspections of evidence of reservoirs (septic tanks) balancing for each recreational properties is the next possible way how to improve the water quality.

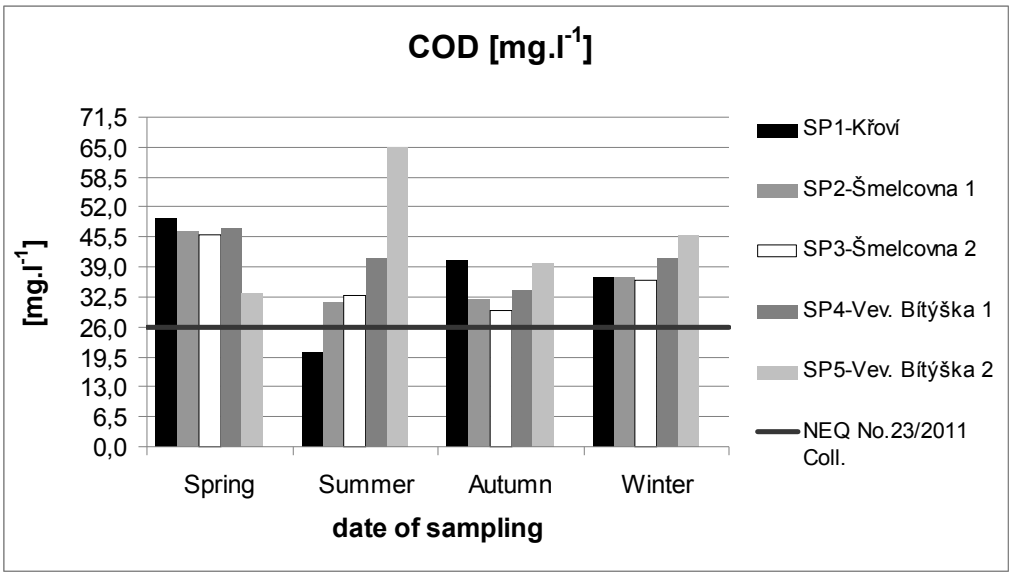

Fig. 2: The amount of COD in the selected profiles and the level of premissible COD amount (NEQ) (author)

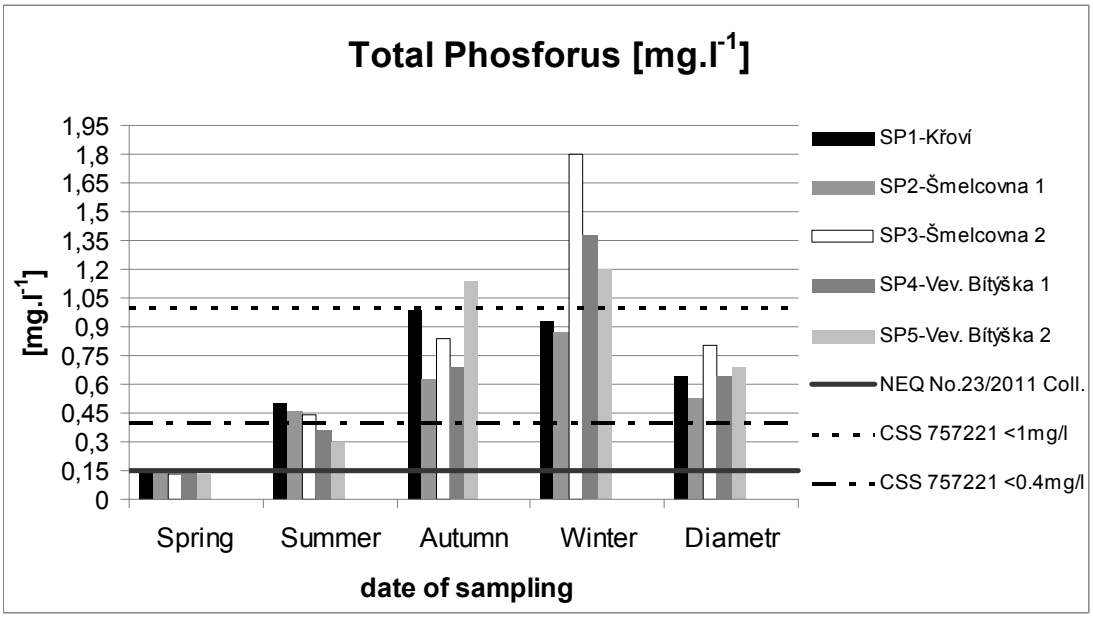

Fig. 3: The amount of phosphorus in the selected profiles and the level of premissible phosphorus amount (NEQ,CSS) (author)

Conclusion

At the Bílý Stream there can be watched only a tiny self-cleaning ability – between the Křoví village and Osada Šmelcovna. In the section from Osada Šmelcovna to its confluence with the river Svratkou it is completely impossible for there to self-cleaning processes. The water quality here is influence by wastewater discharges. There was root WWTP designed for improving of water quality in Natural Part of Bílý Stream Valley. The construction of the plant with nature-related character and the use of self-cleaning processes in soil and wetland environments will reduce the concentrations of COD, ammonia

nitrogen and total phosphorus on the level, which will be permissible under applicable laws of the Czech Republic. While, this building does not interfere with the natural character of the area.

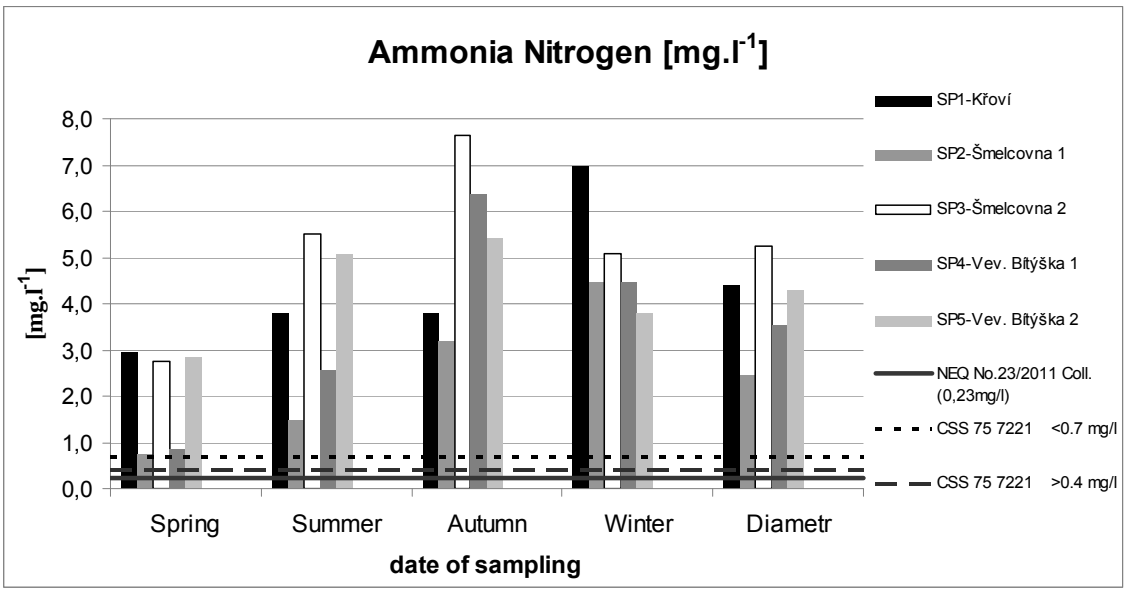

Fig. 4: The amount of Ammonia Nitrogen in the selected profile and the level of premissible Ammonia Nitrogen amount (NEQ,CSS) (author)

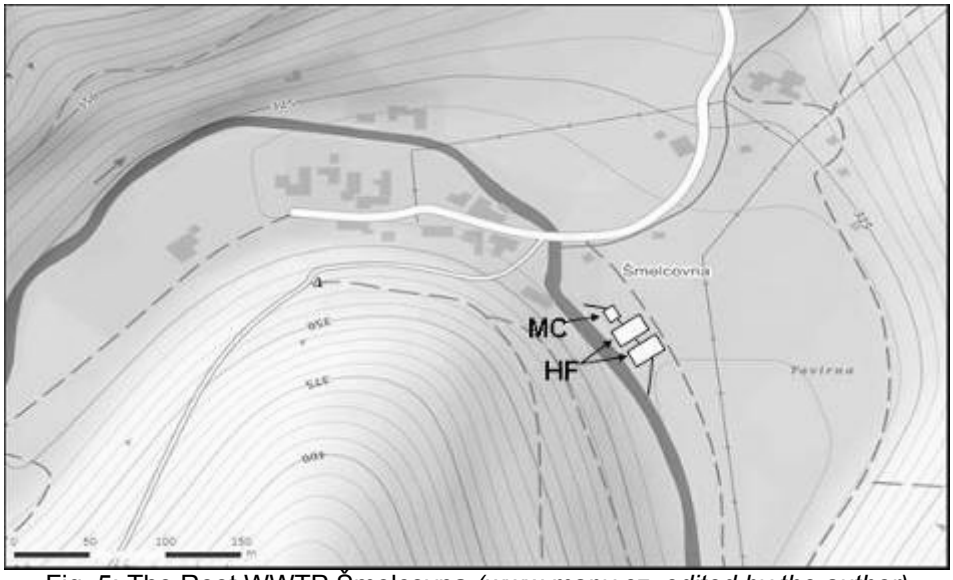

Fig. 5: The Root WWTP Šmelcovna *(www.mapy.cz, edited by the author)*

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Fig. 6: Sampling profile SP1 (author)

Fig. 7: Sampling profile SP2 (author)

Fig. 8: Sampling profile SP3 (author)

Fig. 9: Sampling profile SP4 (author)

Fig. 10: Sampling profile SP4 (author)

Fig. 11: Osada Šmelcovna (author)

Fig. 12: Osada Šmelcovna – bistro (www.geocaching.cz)

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Souhrn
Osada Šmelcovna na Bílém potoce v povodí Svratky je turisticky atraktivní lokalita, která je využívána jak pro rekreační účely, tak jako oblíbený cíl cyklistů.
Sezónní návštěvnost této oblasti se negativně projevuje na jakosti vody Bílého potoka. Tento negativní vliv je dán produkcí odpadních vod (OV) z této Osady a především produkcí OV z restauračního zařízení. Tento fakt vychází z nedostatečného čištění OV a zároveň je podložen monitoringem na Bílém potoce. Na základě výsledků monitoringu potoka, kdy byly zjištěny zvýšené hodnoty vybraných ukazatelů jakosti vody (především CHSK, celkový fosfor, amoniakální dusík) dle platné legislativy ČR, bylo navrženo řešení nakládání s OV pro osadu Šmelcovna. Vysoké hodnoty koncentrací amoniakálního dusíku a celkového fosforu v zimním období lze vysvětlit i tak, že rekreanti se v této oblasti, díky nadprůměrným teplotám v loňském podzimním a zimním období, zdržovali celoročně.

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INFLUENCE OF STABILIZATION THE BANKS ON THE QUALITY OF WATER IN THE RESERVOIR

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Abstract
The bank stabilization is a hot issue currently. The research area "Osada" is located on the left bank of Brno Reservoir. There are erosion walls 2.5 to 6 meters tall. The area of banks is considerably damaged and the progressing erosion has become a threat for the buildings standing higher on the banks, including the roads.
The length of the bank section we were to restore is 500 meters. The bank is formed from eroded bedrock, gravel sand with clay and loess loam. The bank is slightly stabilized by the roots of grown trees as the bank gradually passes into a forest. We will also present the effect of clay from the erodible banks on water quality.

Key words: stabilisation, water quality, dam, bank, erosion,

Introduction

During the construction of the extremely technologically complex waterworks, the obvious basis is the perfect stability of the dam and flawless functioning of all its technical components. However, before the dam commissioning, the parts of the reservoir shoreline, where damage due to the operation of the waterwork is to be expected, should be stabilized. The rapid growth of building-up of large water reservoirs in the 20th century caused spreading of the bank stabilization research. The attention was paid to the influence of waterwork on its vicinity, wave regime respectively, due to the shoreline deterioration, predominantly caused by wind-driven waves. The main sources of damage to the reservoir banks come from wind-driven waves, or waves caused by vessel movement. These cause the bank erosion, abrasion (Paulo et al. 2014), (Soldo et al. 2010), (Šlezingr and Zeleňáková, 2010).
Dams and levees are usually protected well by proper technical stabilization methods since their construction. Conversely the shorelines around back water zone are often without stabilization measures due to potential high expenses on the stabilization elements. Dams and levees are usually protected well by proper technical stabilization methods since their construction. Conversely the shorelines around back water zone are often without stabilization measures due to potential high expenses on the stabilization elements. The combination of same adverse factors causes the optimal conditions for wave abrasion progress. Abrasion causes the deterioration of the banks with consequent shoreline retreat and sedimentation of scoured material in the reservoir.
The abrasion process takes place along steep banks of dams and these localities are prone to landslides. Wave destruction activity forms characteristic shores with typical shape.

Classification of the banks according to the degree of damage

Banks of reservoirs are evaluated by the degree of damage in the basic scale 1 to 5. 1st degree of damage (height banks above 3 meters) it occurs in many reservoirs. For example - valley reservoir Brno, where the height of the banks moves 2.5 - 6 m.
5th degree of damage represents the minimal damage to the shore. This group may include for example beach, rock.
Presentation degrees of damage:

- **1st degree of damage** - an extensive damage to banks by the most intensive erosion; the sections most exposed to waves; the slopes are steep or even vertical, resistance to damage is minimal; erosion walls are over 3 - 5 m high.
- **2nd degree of damage** - intensive erosion; steep, almost vertical erosion walls, 1–3 m high; the vegetation cover is inefficient regarding erosion prevention (as in the previous case).
- **3rd degree of damage** – erosion damage not significant, the banks consist of slightly erodible rocks; erosion walls 0.5–1.0 m high; gentle slopes of reservoir banks where the protective function of suitable riparian stands can be effective.
- **4th degree of damage** – very slight erosion, small amount of eroded material; erosion walls 0.5 m high at maximum, the bank consists of hardly erodible rocks or has a character of a beach; gentle slopes can be stabilized by low forest stands, grass carpets, etc.

- **5th degree of damage** - banks without erosion; consist of hardly erodible rocks; banks in protected coves, wind shade, protected by riparian stands; beach banks.

The shore abrasion process is the result of wave regime, bank vegetation, human activities and climatic, geomorphologic and geologic factors. A suitable bank reinforcement may prevent creation and development of subsequent abrasive and erosive damage. The key to successful bank stabilization is to check the shore line retreat.

The most important aspects

The basis for an appropriate and if possible timely bank stabilization and the minimization of negative effects on the reservoir as a whole (shoreline retreat, sediment silting, and eutrophication) is a professional assessment. According to the results of such assessment it is possible to elaborate the estimation of the shoreline retreat by either of the currently used methods (Šlezingr, 2003), (Pelikán, 2013). Bank erosion and therefore the origin and progress of bank abrasion requires three simultaneous conditions.

These conditions are characterized as factors conditional to the origin of bank abrasion:

1. The bank must be composed of erodible material.
2. The slope of the bank has to be higher than 5°.
3. The wind run should be longer than 100 m, or the bank has to be strained with waves caused by vessel movement.

Factors leading to the origin and following progress of bank abrasion are:

1. Wind-driven waves.
2. Vessel-driven waves.
3. Water-level fluctuation.
4. An effects of ice and thawing.
5. An effect of ice cover and floes movement.
6. An effect of water infiltration through soil.
7. Anthropogenic effects.

The bank stability is radically affected in case of the origin and progress of abrasion. Due to bank erosion and shoreline retreat an irreversible soil loss occurs on forest and mostly agriculture land.

A transport of sediments from eroded banks toward the reservoir bed occurs, thus decreasing its volume.

The water quality of the reservoir is significantly affected and eutrophication occurs. Other material can be transported to the reservoir as well, for example forest floor cover after harvest, organic residue from agriculture land, excess fertilizers etc.

The solution to the problem is proper bank stabilization of endangered areas. Basic division of stabilization measures reflects mostly the materials and approaches used. They are:

- Technical stabilization (with the use of coarse stone, concrete, prefabricates, deadwood, quarry stone, gabions etc.) (Šlezingr et al. 2010).
- Biotechnical stabilization (vegetated rock toe structure, vegetated placed rockfill structure, fascine gravel drum, wattle work fence filled with stone) (Šlezingr and Jedlička, 2010), (Šlezingr, 2011).
- Engineering biology stabilization (vegetation stabilization carpet, sowing of grass stabilization systems, riparian suitable tree species planting, fascine cylinders etc.)

Was carried out extensive monitoring of riparian abrasion on the valley reservoir Brno. One of the monitored sites are also area of “Osada”, (Fig. 1). Erosion walls are over 2.5 – 3 m high.

On the basis of the agreement with the administrator of the waterworks were built to test the stabilization measures, which will be monitored. The stabilization measures were implemented experimentally in endangered area “Osada” in 2013 and 2015 (Fig.2, Fig.3).

In the following period will be performed observing the influence of the built stabilization measures on the bank erosion and the collection of the material into the reservoir. The results of observations will be presented in the following period.

Fig. 1: Valley reservoir Brno, area of “Osada”, erosion walls are over 2,5 – 3 m
Photo M.Šlezingr,

Fig. 2: Biotechnical stabilization - wattle work fence filled with stone – during construction in 2013
Photo M.Šlezingr

Fig. 3: Biotechnical stabilization - wattle work fence - construction in 2015
Photo M.Šlezingr

Conclusion

The Brno Reservoir has over 4 mil. m^3 of sediments. About 15% of these come from eroded banks, the rest is mostly the material washed from fields along the stream above the reservoir.

As the reservoir is very popular for leisure activities, water quality is one of the main prerequisites for the development of the area (Junáková and Bálintová, 2011), (Pelikán and Marková, 2013), (Šlezingr and Fialová, 2012).

These procedures considerably helped to improve the water quality in the reservoir; however, they are not sufficient to maintain the water quality (Korytárova et al. 2007), (Marková et al. 2014), Šoltész and

Baroková, 2006). Currently, the influx of sediments (and nutrients) to the reservoir is minimized by water aerating using a set of aerators during the recreation season and dosing coagulants at the end of backwater.

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INTEGRATED TOURISM STRATEGY BASED ON COMMUNITY PLANNING

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Abstract

Community planning as a part of community led local development represents new approach to encourage local communities to developing integrated bottom-up approaches where is a need to respond actually to local challenges and stimulate innovation approaches to the development of municipalities and regions. This paper aims to represent one practical example of a collaborative formulation of main goals for integrated tourism strategy on the territory of LAG Kyjovské Slovácko - Region full of Life. A mixed-method approach was applied to explore attitude of regional subjects to sustainable tourism development in selected region. Both questionnaire surveys and personal interviews were used as well as the results (SWOT analysis) of the working group meetings with facilitator service. The results provided a basis for the formulation of problems and their solutions in the field of sustainable rural tourism. In particular, the tourism components which local stakeholders consider to be important to solve in order to increase the sustainable rural tourism potential in the region and ways of strengthening local relationships were defined.

Key words: Community Led Local Development, sustainable rural tourism, inter-municipal cooperation, LAG Kyjovské Slovácko

Introduction

Community planning represents a planning carried out with the active participation of the end users (Wates, 2000). It means generally a method for planning the development of services for a selected group of people. The discussion takes place through the agency of the expert facilitator (experts in the field of management and project management). In the course of community planning different methods and analysis approaches are used, most common is the SWOT analysis. Very effective and practical leadership form of community planning are so-called round tables where the main role is played by open discussion and conversation with the assistance of the facilitator.

There is not such a long tradition of community or participatory planning in the Czech Republic, unlike other Western countries. Community planning is gradually becoming part of the development strategies of local action groups (LAGs) in the Czech Republic.

The European Commission perceives LAGs as a group made up of public and private partners from the rural territory that include representatives from different socio-economic sectors. They receive financial assistance to implement local development strategies, by awarding grants to local projects.

A new tool, within the LEADER approach, appears for LAG´s activities in the new programming period 2014 – 2020. It is the so-called community-led local development (CLLD). According to the European Commission (2014) *"CLLD is a dedicated tool for use at sub-regional level and thus complements other development support at local level. It has the capacity to mobilise and involve local communities and organisations so they can contribute to smart, sustainable and inclusive growth"*. Within the CLLD the LAGs should design and implement the community-led local development strategies (and the final integrated strategy) which will be the main documents for LAGs activities. One of very important LAG´s activity in rural areas is also to support the development in the field of sustainable tourism. CLLD in tourism is closely connected with the term ecotourism. Especially in developing countries, but not only there, ecotourism seems to be a good tool for regional development within all pillars of sustainability. Community participation in ecotourism and sustainable tourism management is widely discussed (Jones, 2005; Wang, Tong, 2009; Messer, et al., 2010). This approach could be also the link to conservation practices and perspectives (Stem, et. al., 2003).

The principles of community planning were also used for formulating the basic points for the integrated tourism strategy in the territory of LAG Kyjovské Slovácko - Region full of Life. The next text represents one practical approach and example of a collaborative formulation of main goals for tourism strategy in the Czech Republic.

Materials and methods

The LAG "Kyjovské Slovácko - Region full of Life" is situated in the north-eastern part of Hodonín district in South-Moravia region (Fig. 1). This region is geographically and administratively defined for the purposes of implementing the new strategy. LAG cooperates with 45 municipalities with 62 253

inhabitants (1.1.2013). The land area is 500 km^2 and population density 125 inhab./km^2. This region belongs to the typical rural regions from the point of view of criteria applied by the EU.
The region is well-known for rich folkloric and spiritual traditions and traditions of Moravian wine and viticulture. This region is still unaffected by tourism although the potential for sustainable tourism is great here. In the surrounding of the region are well-known tourist areas – Strážnicko, Baťa canal (European Destinations of Excellence), many wine cellars, Pálava region, Nové Mlýny dams, Lednice-Valtice area (UNESCO's World Cultural Heritage) and many others.

Fig. 1: Localization of LAG "Kyjovské Slovácko – Region full of Life" in the South Moravian Region

To obtain main goals of the paper the set methodological steps were followed.

A. Questionnaire survey for representatives of 45 municipalities included into the LAG. The survey was very short and aims to the use of financial funds for tourism purposes. The questions were following.
    1. Do you use/have you used financial funds for supporting activities within the tourism sector in 2007-2013? If yes, at what level? Do you plan to use the new programming period financial instruments to support tourism activities in your area?
    2. Which the most significant issues do you deal with in the field of tourism?
    3. For what tourism activities would be useful to ensure cooperation and community planning with other subject in your area?
    4. Which areas of tourism do you want to develop? Which activities are the crucial for the development of the region?
B. Recording the course and results of two working groups using the principles of community planning in the form of roundtables. The free discussion was conduct by facilitator. The working group consisted of representatives from business and non-profit organizations. The method of SWOT analysis was used and participants´ opinions on sustainable tourism in the region were reordered.

The final draft of strategic goals for integrated tourism strategy for the "Kyjovské Slovácko – Region full of Life" is the result of applied methodological steps (synthesis of acquired information).

Results

The questionnaire survey addressed all 45 mayors within the competence of the LAG. In terms of use of financial funds for supporting activities within the tourism sector following information has been found: 1) the most municipalities used the opportunity to finance their activities in tourism development from European funds. Almost 63 % of municipalities used also financial funds from national and 44 % from regional level as well. All asked mayors are decided to use financial support in following period for next activities supporting sustainable tourism as an important development issue in their region.
The most important issue is insufficient tourist infrastructure according mayors´ opinions (34 %). The adequate tourism infrastructure is a prerequisite for effective tourism development and it may become an advantage of the region. A weak promotion (20 %) and a lack of finance (18 %) are other important issues for development of tourism in region. All mayors also support the idea of community planning in all thematic tourism issues and they prefer the cooperation on the collective propagation of the region. The tourism potential is seen in folkloric and wine traditions, cycle tourism round natural and historical monuments.

Results of working groups using the principles of community planning in the form of roundtables is the SWOT analysis represents strengths, weaknesses, opportunities and threats in the field of sustainable tourism in the region of LAG.
Participants of round tables agreed that the main strength of the region is in its folkloric, cultural and wine traditions. These regional components form values and image of the region and it is very important to support them within the cooperation in the region. Cycle tourism and potential for adequate tourism infrastructure was also mentioned. Very strong strength is represented by active fellowships and associations which coordinate cultural, sport, social activities. Hospitality and friendliness of local residents was also mentioned as an important characteristic which can support the image of the region as a friendly place ideal for visiting.
Typical weakness of the region is seen in the lack of touristic infrastructure (density and quality of trails and its bad interconnection, a lack of other types of trails as bridleways and appropriate facilities). The insufficient communication and ineffective partnerships between local entities is also considered a strong weakness. Inadequate promotion of traditional product and crafts, lack of financial support, weak promotion of the whole region as a tourist destination and also lack of interest of some citizens in regional event were mentioned as other weaknesses.
Conversely, the potential for cycle tourism and agro tourism and increasing demand in this field in connection with folkloric and cultural traditions are considered as opportunities for the region. Equally important is the opportunity to seek new forms of cooperation between municipalities, local actors, public and private sectors. Finally, it is important to use possibilities of a multi-source financing.
Threats are associated mainly with the depopulation and population ageing. The society fragmentation and fading need to do things together is increasingly perceived. The strong, more active surrounding regions could be also the important threat.

The final draft of strategic goals for integrated tourism strategy for the “Kyjovské Slovácko – Region full of Life” is represented by following points. The main key areas for tourism development in the region are:

- Support local folklore, protection of cultural heritage and spiritual legacy;
- Restoring and maintaining traditions;
- Development of wine tourism;
- Support community life;
- Increase the attendance of local and regional events and festivities;
- Support new tourism infrastructure and facilities;
- Systematic care for the landscape, historical monument etc.;
- Build new tourist destinations and attractions of the region;
- Common promotion of whole region and its components, marketing and mutual communication within the region;
- Use destination management
- Effectively use of multi-source financing possibilities.

Conclusion

Results aimed to a basic draft of strategic points for integrated tourism strategy for the territory of LAG “Kyjovské Slovácko – Region full of Life” is possible summarize based on the questionnaire surveys addressed 45 mayors and activities of two working groups using community planning principles in the form of roundtables. If we talk about the significance of activation of local partnerships, strengthening local binding and solving issues based on community planning, all addressed subject believe that all these components must be fulfilled for the sustainable regional development. Participants in the working groups point out mainly the bad social communication between individual subjects in the region. On the other hand, activities in tourism development could be the first example of effective form of cooperation between subjects and the possibility how to support the image and cooperation within the region through common destination management and tourism strategy based on community planning. Local stakeholders also realize that living folkloric traditions, rich cultural history and range of cultural events complemented by viticulture distinguish their region from the others. Furthermore, all respondents agree that new programming period brings the possibility of multi-sources financing and they plan to use this option in the future.

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Souhrn
Komunitní plánování a komunitně vedený regionální rozvoj se postupně stává novým přístupem v rozvoji regionů v České republice. Příspěvek prezentuje příklad využití principů komunitního plánování při sestavování strategie rozvoje turismu na území místní akční skupiny Kyjovské Slovácko v pohybu. Strategické oblasti byly sestaveny na základě výsledků dotazníkového šetření (osloveno bylo 45 starostů) a aktivit dvou pracovních skupin ve formě kulatých stolů, kde byla diskutována problematika rozvoje cestovního ruchu v regionu za pomoci facilitátora a výsledkem byla SWOT analýza možností rozvoje cestovního ruchu v oblasti. Z výsledků vyplývá, že region může svou image stavět zejména na folklorní, kulturní a vinařské tradici. Za největší nedostatek je považována slabá úroveň komunikace a spolupráce místních subjektů. Největší výzvou pro region je tvorba kvalitního destinačního managementu, rozšíření využívání principů komunitního plánování a možnost vícezdrojového financování aktivit spojených nejen s oblastí cestovního ruchu.

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MAGICAL TRAILS IN CHŘIBY MOUNTAINS

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Abstract
Magical trails are common activity of Chřiby Association. The project aims to create a network of trails connecting the lesser known places at Mikroregion Chřiby. This network bounds other activities such as vistas, panoramas, landscape, greenery, genius loci.

Key words: *:* trail network, local initiative, alley

Motto:
Each one of us has his own path he walks, sometimes he is joined by someone left, then he has to walk alone for some time and so we all walk on year after year until we all meet on the same place.
Jiří Pavlica (2014)

Introduction
Chřiby - original meaning of the word "hills" - is very attractive for the diversity of wandering ways through the countryside. Numerous expeditions streamed over the Chřiby already in ancienit history. We can find many tracks here – like archaeological localities, old fortification, rocks, little caves, cairns and old trails, that most easily discover cycling, cross-country skiing, on horseback or on foot. Along rails and paths there were always alleys, which long ago was planted as a natural orientation lines, both in practical and the viewing direction. The hikers and cyclists appreciate today shading trees in hot summer days, skiers again lee in winter. Existing grown beech tree lines and guided trails undoubtedly inherently complete the genius loci and legends, which are so typically for Chřiby.

Association supporting local initiatives Chřiby
Association of Municipalities Bařice-Velké Těšany, Halenkovice, Jankovice, Kostelany, Kudlovice, Lubná, Roštín, Vrbka and Žlutava accompanied by significant business partners such as Ranch Kostelany and company Rudolf Jelinek took aim - support Chřiby, this until recently neglected part of South Moravia.

Lookout tower Brdo
Construction of a new lookout tower on hill Brdo became the first significant act of Association. The observation tower stands on the top of Chřiby and is there 23.90 meters high. It replaced the original wooden tower 20 meters high, which in the seventies expire. The construction was made from top quality sandstone from a quarry Žlutava and oak wood from local forests. Building was started October 28, 2001 with the foundation stone by scouts from Modrá and inaugurated three years later in 2004.

Magical trai l- conception
Magic trails project is realized by members of Association like network of field trips, bike paths, hiking trails and bridleways. Based on detailed surveys of historical maps and materials were the existing communication network complemented by historic trails, as well as an established traditional ways and was designed starfish interconnection for each individual municipality. Lookout tower Brdo is there in dominant position, from which the paths diverge in all directions.
The concept suggest planting of different green along selected communication path - in forests are mainly shrubs and lower trees, in the open countryside area long-lived trees and in the foothills of Chřiby traditional fruit trees. There are specific unique panoramic route and places vistas, where the green framed individual landscape segments. The choice of tree species is strictly governed by habitat conditions, but preferably are designed Chřiby typical trees, which are tied to the Celtic tree calendar. The concept also envisages the benefits of fytoncides produced trees that have a positive effect on the human body.

Implementation of the project
The biggest obstacles represent the property of land. Although municipalities have owned a large portion of field and forest plots, over time the roads were moving and rutted outside ownership plot. Therefore is necessary make geodetic land lay out , what is expensive.
Another barrier are protective zones of aboveground and underground network. Planting trees have to respect the protection zones.

There is neccesary a lot of cooperation with other users of the landscape - transport, energy, farmers etc. to reach agreement with such project.
In 2014 were done restoration of landscape greenery on the cadastral Kostelany – three historic routes including the "fruit", "meadow" and "forest" alleys and new system of oak alleys in Kostelany ranch.
This year is developing the project "Orientation and relaxing elements mountain bike Halenkovice". Now, negotiations are underway, connected with trails situated at church property and forests, managed by Lesy ČR.


Fig. 1: Pear alley


Fig. 2: The road in Chřiby mountains

Conclusion
Chřiby are rich in natural, historic and cultural attractions. Project Magical trails is based on the principle of communication - not only the creation of a system of communication routes, but also communication between members of the association in the preparation and implementation of joint projects. Myths landscape of Chřiby has great turistical and development potential. Project Magic trails offers a variety of options how to use this wonderful potential.

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Souhrn
Chřiby jsou bohaté na přírodní, historické i kulturní zajímavosti. Projekt Magické cesty je založen na principu komunikace - nejedná se pouze o vytvoření systému komunikačních tras, ale i o komunikaci mezi jednotlivými členy sdružení při přípravě a realizaci společných záměrů. Mýty opředené Chřibské lesy mají v oblasti turistického ruchu velký rozvojový potenciál. Projekt Magických nabízí řadu možností, jak tento potenciál ještě lépe využít.

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MANAGEMENT OF ECOTOURISTIC RESOURCES IN SOUTHER DOBROGEA, ROMANIA

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Abstract
Southern Dobrogea is a region in South-Eastern part of Romania located between Danube and Black Sea Coast. This region has many protected areas where are preserved various components of environment. The aim of this paper is to identify protected areas as touristic resources and opportunities of capitalization for educational and scientific purpose, by ecotouristic routes. Ecotourism offers optimal conditions for motivation of touristic consumption, through education, research, recreation, and aims to protect and preserve biodiversity and landscapes. Management of these resources as part of tourism and other touristic attractions can contribute to develop of sustainable tourism in rural area from Southern Dobrogea.

Key words: ecotourism, education, rural area, Dobrogea

Introduction

Southern Dobrogea is an unit of tableland located in South-Eastern part of Romania, between the Danube and the Black Sea Coast and it is a territorial system well highlighted. In this territorial system are two subsystems: natural macro-system and socio-economic macro-system. The natural macro-system components (relief, soil, water, climate, vegetation, fauna) and character of uniqueness or originality underlying to development of protected areas in this region. The geographical analysis of the territorial system is essential in defining the type of regional development, which considers the achievement of socio-economic and cultural finalities. Ecotourism is a form of tourism related knowledge and protecting the environment, biodiversity, wildlife, ecosystems focusing on the need to educate of tourists on environmental issues and means of maintaining it. It is the segment of tourism that involves traveling over natural areas relatively undisturbed, to admire the landscape and enjoy the wilds of plants and animals. In areas of ecotourism, living human communities with ancient traditions, making it necessary to protect local identity and culture for the development of tourism to be beneficial for these populations. The aim of this paper is to identify protected areas that can be used as ecotouristic resources. The optimal management of these ecotouristic resources will be a key-factor for a sustainable rural tourism in Southern Dobrogea.

Material and methods

In order to identify the main touristic attractions in Southern Dobrogea issues were used both, written sources and cartographic documents and research methodology consists of bibliographic documentation, field research, identification of protected areas and development of cartographic materials to highlight opportunities for improvement of their ecotourism purposes. Protected areas as resources for ecotourism have scientific and educational role can be exploited as touristic attractions on traditional routes or as main components of ecotouristic trails and circuits with ecotouristic profile. Mapping of these aspects of natural and cultural heritage has an important role in the diagnosis and prognosis of sustainable rural tourism in this territory of Southern Dobrogea.

Results

Southern Dobrogea is a Plateau Unit from South-Eastern part of Romania situated between the Danube and the Black Sea region, a typical platform, with an area of 5335 km^2. The altitude of plateau presents an average of 75-100 m, the lowest plateau of Romania, with tabular appearance and smooth like a plain, but presents orientation, different slopes and fragmentation, curl and even drop altitude, with a temperate climate continental with Mediterranean influences in the South-West, and otherwise arid continental moderate slightly towards to Danube and Black Sea Coast. The flora and fauna is predominant of steppe, only the South-West area being a number of forests with diverse floristic composition. The particularities of flora and fauna, the special landforms, fossils with some stratigraphic value (some with unique value), as well as some interesting caves, imposed declaration of protected areas. All protected areas from Southern Dobrogea were declared in accordance with the specific legislation from Romania and are registered at Regional Environmental Protection Agency of Constanta. In Southern Dobrogea Plateau there are 30 protected areas, with a total area of 12,630 ha, of which: 2 zoological natural reserves (*Techirghiol, Agigea Lakes*), 3 botanical natural reserves (*Marine Dunes from Agigea*, *Forests of Valu lui Traian and Neptun*), 10 geological, paleontological,

speleological of protected areas (*Peretii calcarosi de la Petrosani*, *The neojurasic reef of Topalu, Fossil Points of Aliman, Cernavoda*, *Credinta, Movila Banului*, the caves of *Gura Dobrogei, La Adam, Limanu, Obanu Mare – La Movile*), 15 mixed protected areas (*Coastal marine aquatorium 2 May-Vama Veche, Allah-Bair Hill, Canaraua Fetii, Dumbrăveni, Esechioi, Fantanita-Murfatlar, Hagieni Forests Bratca, Cetate, Celea Mare-Valea lui Ene forests, Bugeac, Dunareni, Oltina, Vederoasa lakes, Swamp of stud from Mangalia*). Each protected area is in the custody of Local Authorities, Regional Forestry Department or Dobrogea Litoral - Regional Water Department. *The Coastal-marine aquatorium 2 May-Vama Veche* is in the custody of Marine Research Institute from Constanta, *The cave Obanu Mare – La Movile* is in custody of Underwater and Caving Explorations Group from Bucharest and *Marines Dunes Reserve from Agigea* is in custody of Al. I. Cuza University from Iasi.
In Figure 1 are located the protected areas with geological, paleontological and speleological specific: Botanical, geological, and paleontological natural Reserve *Allah-Bair Hill*, with an area of 10 ha; Geological and paleontological natural Reserves as *Neojurasic Reef from Topalu* (21 ha), *The Fossil Points Movila Banului* (11 ha), *Cernavoda* (3 ha); Paleontological natural Reserves as *The Fossil Points Aliman* (11 ha), *Credinta* (10 ha), Geological natural Reserve as *Peretii calcarosi de la Petrosani* (8 ha) and Speleological and morphogeological natural Reserve *Obanul Mare si Pe□tera "La Movile"* (12 ha).

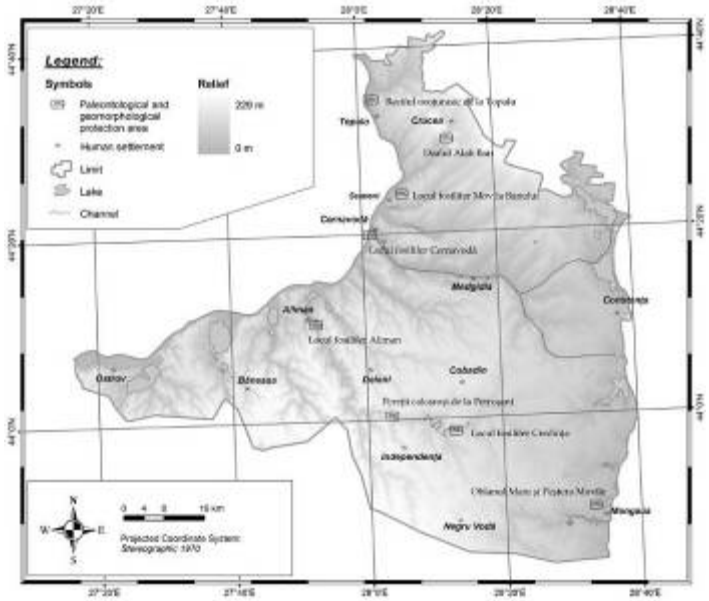

Fig. 1: Southern Dobrogea: Geological, paleontological and speological protected areas

In figure 2 is the location of mixed protected areas as important bird areas: *Vederoasa Lake* (517 ha), *Dunareni Lake* (704 ha), *Oltina Lake* (2290 ha), *Bugeac Lake* (1434 ha), *Swamp of stud from Mangalia* (98 ha) and zoological natural Reserve *Techirghiol Lake,* wetland of international importance, 1230 ha.
Figure 3 shows the main mixed protected areas: the scientific zoological and botanical Reserve *Coastal-marine aquatorium 2 May-Vama Veche* (5000 ha), Botanical natural reserve *Marine dunes from Agigea* (8 ha), Botanical and zoological natural Reserves *Hagieni Forest* (432 ha, which 207 ha scientific area) *Fântânița-Murfatlar Forest* (83 ha, which 67 ha scientific area) *Dumbrăveni Forest* (316 ha), *Esechioi Forest* (28 ha), *Canaraua Fetii Forest* (172 ha) and Archaeological-Botanical natural Reserve *Valu lui Traian* (5ha).

Discussion
In the context of world tourism, ecotourism has developed rapidly, attracting tourists with respect for nature and local culture. Ecotourism is based on the observation of nature, offering distinct touristic products, specific forms of cultural, scientific and research tourism in areas of outstanding biodiversity with natural reserves and local communities that have preserved unaltered customs and traditions. Ecotourism involves leadership, organization and development of tourism in order to do not disturb or destroy the natural balance, the natural environment with natural touristic resources and cultural-historical or technical-economical values and achieve their sustainable exploitation.

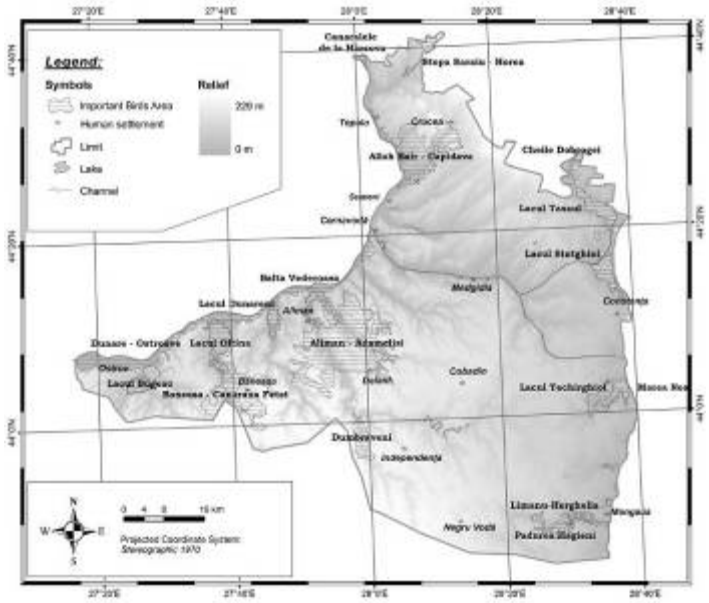

Fig. 2: Southern Dobrogea: Bird protection areas

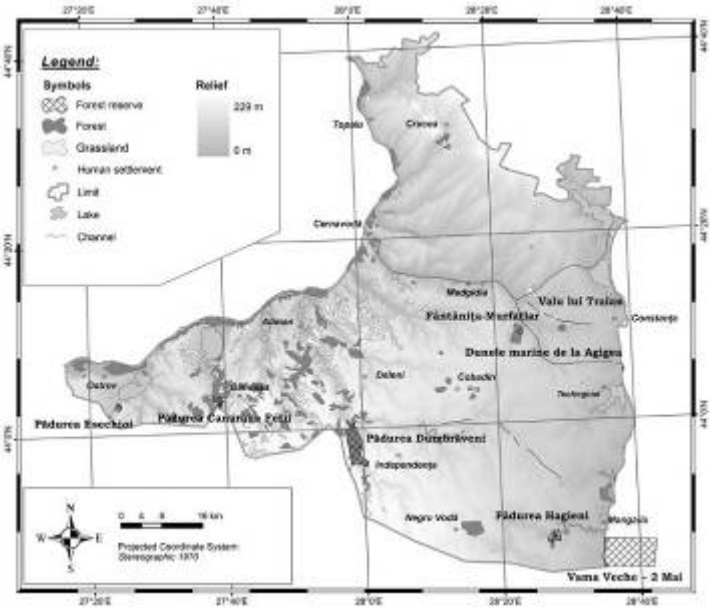

Fig. 3. Southern Dobrogea: Forests and Forestry protected areas

Ecotourism is associated to natural reserves, which can be found, along with the function of protecting and preserving and investment for protecting, but also to support for traditional rural economic development and maintaining social and cultural - historical traditions of local communities. In association of ecotouristic resources from Southern Dobrogea can be identified trails with ecotouristic profile. The polyvalent touristic routes offers for visitors protected areas as "*ecotouristic resources*" or "*destination of ecotouristic consumption*", and other touristic resources (cultural, seaside resorts, recreational areas for fishing and water sports):

A. ***Ecotouristic route Constanta – Vama Veche***: *Marine Dunes from Agigea*, *Techirghiol Lake*, *Swamp of stud from Mangalia*, *Hagieni Forest*, *Obanu Mare - La Movile Cave* and *Coastal-marine aquatorium 2 May-Vama Veche*;
B. ***Ecotouristic route Constanta – Ostrov***: *Valu lui Traian Botanical Reserve, Fantanita-Murfatlar Forest*, *Credinta Fossil Point*, *Canaraua Fetii Forest*, 10 – *Esechioi Forest* and *Bugeac Lake*;
C. ***Ecotouristic route Băneasa – Topalu – Constanta***: *Oltina Lake*, *Dunăreni Lake*, *Alimanu Fossil Point*, *Vederoasa Lake*, *Cernavodă Fossil Point*, *Movila Banului Fossil Point, Neojurasic Reef from Topalu* and *Allah-Bair Hill*.

The touristic management of protected areas requires the following actions:

- Organizing a *Touristic Information Centre*;
- Efficient setting of entry and exit points of the tourist spaces and reservations, itineraries;
- Organization of tourist traffic by establishing tourist flows, their size, frequency, duration of visit;
- Arranging the accommodations, food, sports and leisure under specific conditions, specific resources, with principles of tourism planning and development standards indicators;
- Arranging ecotouristic resources for visiting;
- Restoring landscapes and landmarks with risk of degradation;
- Signaling ecotouristic objectives with facilities and utilities.

Conclusion

Ecotouristic resources creates optimal motivation of touristic consumption through research, study, recreation, education and must be exploited so as not to distort the environment, landscape, authentic and especially the lives of animals, plants and local population.

This form of tourism will help to educate of tourists in environmental issues and means of maintaining it.

Ecotouristic resources are the protected areas considered "*raw material*" or "*destination of touristic consumption*" in which the touristic activity must take into account the protection and conservation of ecosystems.

It is *mandatory* the existence of a *Tourist Information Center*, in order to submit access points and itineraries, without prejudice to protected elements.

By harnessing of the ecotouristic potential are created optimal conditions for touristic consumption motivation, research, recreation, education, given the protection and conservation of landscapes and biodiversity.

The management of ecotouristic resources is an important factor to contribute alongside other resources with cultural and agritouristic specific, for development of polyvalent sustainable rural tourism in Southern Dobrogea.

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Souhrn

Cílem tohoto příspěvku je určit chráněné oblasti, které mohou být využity i jako zdroj ekoturistiky. Optimální správa těchto ekoturistických oblastí bude klíčovým faktorem pro udržení venkovské turistiky v oblasti Jižní Dobrudža. Chráněné oblasti s možností využití pro ekoturistiku mají vědeckou a naučnou roli, kterou můžeme chápat jako turistickou atraktivitu na původních cestách nebo jako hlavní složku ekoturistických tras a okruhů s ekoturistickým podtextem.

Mapování prvků přírodních a kulturních památek hraje důležitou roli při stanovování a prognóze podmínek pro udržitelnost venkovské turistiky v Jižní Dobrudži. V náhorní plošině Jižní Dobrudži se nachází třicet chráněných oblastí o celkové výměře 12,630 ha, které jsou zastoupeny dvěma zoologickými přírodními rezervacemi, třemi botanickými přírodními rezervacemi, deseti geologickými, paleontologickými a speleologickými chráněnými oblastmi a patnácti smíšen&y acute;mi chráněnými oblastmi. K propojení těchto ekoturistických prvků Jižní Dobrudži může být uskutečněno v rámci

stávajících cest, díky nimž mohou být tyto chráněné oblasti zpřístupněny jako „*ekoturistické cíle*“ nebo „*destinace určené pro ekoturismus*“ včetně propojení dalších turistických lokalit (kulturních památek, přímořská letoviska, rekreační oblasti určené pro rybolov a vodní sporty). Využitím ekoturistického potenciálu jsou utvářeny optimální podmínky pro motivaci potenciálních turistů, výzkum, rekreaci, vzdělání, vztažené k ;ochraně a zachování přírody a biodiverzity. Management ekoturistických zdrojů je důležitým faktorem, který přispívá spolu s dalšími zdroji, jako jsou kulturní a agroturistice specifika, k rozvoji polyvalentní udržitelnosti venkovského turismu Jižní Dobrodži.

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MATERIAL PROPERTIES OF NATURAL MATERIALS IN THE PAVEMENT OF LOW VOLUME ROADS

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Abstract
Low volume roads have many roles in the landscape, enabling access to forests being one of the main ones. As forest roads, apart from public roads, run through many national parks and protected areas, their use for recreational purpose is also very important. These areas often suffer from bad humidity regime that has bad effect on bearing capacity of subgrade. Moreover, construction activity in these regions is under close control of environmentalists, conservationists and users, limiting the choice of technologies and materials used. The reliability, durability and efficiency criteria, however, remain. The aim of this article is to show the problems accompanying the preparation of an appropriate material deformation characteristic (Resilient Modulus) that is able to capture the effects of humidity and at the same time is suitable for use in the numerical model based on FEM (Finite Elements Method) for design of forest roads contruction.

Keywords: Resilient Modulus, CBR cyclic, soil, capacity limit

Introduction

Low volume roads are known all over the world as LVRs. They are classified depending on the quantity of vehicles that pass through them and the total weight of them. The most critical case is passing 400 vehicles whose total weight is of 10 Tn in one shaft. Furthermore, this type of roads have to deal with big loads but in comparison with public roads, the traffic is much lower.
LVR roads have different functions in the landscape, being the most important enabling access to the forest, fields and towns apart from the city. Country roads are not only for transport between points where natural parks and protected areas are located, but are also used for open-air activities such as trekking or cycling.
The main problem of these roads in those areas is that they suffer from high grades of humidity having a terrible effect on the capacity of the subgrade. For this reason, the construction of those roads is limited to certain technologies whose aim is to improve the natural material of the subgrade and other materials used in the layers of the pavement. However, the fiability, durability and the efficiency criteria do not vary.
On the other hand, the quality and durability of the pavement depend on mechanical characteristics of the subgrade and the materials of constructive layers, more specifically on the Resilient Modulus. Moreover, humidity changes the value of this modulus and it must be compatible with different numerical model of calculus, especially the one based on FEM for analyzing the deformation of the pavement and make the simulation of its behaviour depending on the used material. For that reason, the purpose of this article is to show the verification of the CBR cyclic test developed at Delft University of Technology that was further modified at Mendel University of Brno for obtaining the Resilient Modulus.

Theory of Resilient Modulus

Design of constructions is generally based on the knowledge of the value of the Resilient Modulus (M_R). Resilience is known as the energy absorbed by one volume unit of a material while it deforms elastically. In other words, it is the capacity that a solid shows against stress without suffering big deformations. It is depicted in the area below the line stress as it can be seen in the Figure 1.
Elastic limit, Sy, is shown in the Figure 2. It can be explained as the maximum stress that an elastic material can support without being deformed plastically. If the material suffers from higher stresses than its elastic limit, it will be deformed and it won't recover its original shape. Once the elastic limit is reached, if the material continues suffering from stress, it will reach its fracture point, σ_u, and break (Figure 2.).
For that purpose, it is necessary to know the elastic limit of the material. If the stress applied to it is lower, the material will not deform. Nevertheless, it is necessary to calculate the elastic limit of a material because without that value we cannot construct a road or a structure totally safe.
The elasticity law, known as Hook's law defines the relation between stress and longitudinal deformation. So directly is related to the modulus of Young (E). This modulus represents the rigidity degree of a material. Graphically is the slope between the stress (σ) and deformation (ε) in figure 2.

Moreover, it is applied only until the elastic limit, because in upper points behave of the material changes. The equations of this law for 3D are the next ones (1):

$$\begin{cases} \varepsilon_x = \frac{1}{E}[\sigma_x - \nu(\sigma_y + \sigma_z)] \\ \varepsilon_y = \frac{1}{E}[\sigma_y - \nu(\sigma_x + \sigma_z)] \\ \varepsilon_z = \frac{1}{E}[\sigma_z - \nu(\sigma_x + \sigma_y)] \end{cases} \quad (1)$$

Where:

E = Young's modulus
σ_x = stress applied in x axe
σ_y = stress applied in y
σ_z = stress applied in z
ε_x = deformation in x axe
ε_y = deformation in y axe
ε_z = deformation in z axe

Soil is an element that has special characteristics, because its behaviour is affected by different factors, particularly humidity and density. For that reason it is very difficult to predict its behaviour and describe it accurately. In order to simulate the real behaviour of the soil under load and at the same time to take into account the mentioned theory, it is necessary to calculate the Resilient Modulus (M_R) that is equivalent to the Young's modulus and is pobtained from the cylic loading test (Figure 3) according to the following equation (2) :

$$M_R = \frac{\sigma_1 - \sigma_3}{\varepsilon_R} = \frac{\sigma_d}{\varepsilon_R} \quad (2)$$

Where:

M_R= Resilient Modulus [kPa]
σ_1 = major principal stress [kPa]
σ_3= minor principal stress [kPa]
σ_d = Applied stress [kPa]
ε_r = Relative deformation [mm]

Cyclic test from the Figure 3 simulates a constant load applied by vehicles on the road during the traffic.

Cyclic test for the determination of the Resilient Modulus

The design of roads in the Czech Republic is based on the empirical characteristic of CBR (ČSN EN 13286–47). CBR test was put into practice for the first time in the 1930s in the United States of America. At the begining, this test was used for designing the thickness of construction layers. Obtained result is the percentage of CBR from the comparison between applied force to analyzed material by a plunger in a defined depth and a standard gravel. According to he Czech law TP 170, the elastic modulus for the design of roads can be obtained from CBR with the next equation (3):

$$E_{TP} = 17{,}6 \cdot CBR^{0{,}64} \quad (3)$$

Where:

E_{TP} = Design modulus (MPa)
CBR = California Bearing Ratio (%)

The modulus taken from the value of CBR does not respect the nature deformation characteristics and it is not equivalent to the Young's modulus.

According to the American Association of State Highway and Transportation Officials (AASHTO), cyclic load tests are considered to be the most appropiate way of obtaining M_R. There are different ways of obtaining this modulus from which the most complex is the cyclic triaxial test (ČSN EN 13286-7), which consists of applying pressure to a cylindrical sample of soil in horizontal direction. Afterwards, horizontal and vertical deformations are measured with transducers and value of M_R (2) is obtained, Poisson's coefficient as well. Due to high investment and length of the test, it is not commonly used.

As an alternative to this test, some Dutch investigations (Molenaar, 2009) conclude that Resilient Modulus could be obtained from the CBR test. This test consists of applying stress with a plunger to a cylindrical sample during some cycles. In other words, the plunger starts applying pressure until reaching maximum stress or maximum penetration and after it comes back until the contact with the sample is over. An this point, the first cycle will be finished and if cyclic test is desired, the process will be repeated starting a new cycle. The machine will repeat cycles until the elastic deformation is constant. For the Resilient Modulus (M_R), the next equation (4) is used:

$$M_R = \frac{C_1\left(1-\mu^{C2}\right)\sigma_0 a}{w^{C3}} \quad (4)$$

Where:

M_R = Resilient Modulus of the soil (MPa)
μ = Coefficient of Poisson of the analyzed material
σ_o = applied pressure by the shaft
a = plunger's ratio
w = measured elastic deformation
C_1 = 1,797 if the mould slips; 1,375 in case of total friction
C_2 = 0,889 in case of slip; 1,286 if total friction
C_3 = 1,098 if slips; 1,086 in case of total friction

Results of CBR test

With the purpose of verifying the value of Resilient Modulus obtained in CBR cyclic test, some tests were carried out with subgrade materials obtained in seven different rural roads. The tests were performed in geotechnical laboratory at Mendel University in Brno (Czech Republic) and in geotechnical laboratory GEOSTAR, s.r.o. From each road 10 profiles were taken and from each profile 6 different samples. Altogether, more than 400 cyclic tests were performed. For all materials, a classification was made based on Czech laws (ČSN 73 1001). Optimum humidity (W_{opt}) and maximum density ($\rho_{d,max}$) were also taken from Proctor Standard and stress during test CBR standard (Table 1).
The verification of the Resilient Modulus determination was performed on the basic cyclic CBR test based on a Dutch theory of repeated loading during a constant penetration of a plunger. The described is marked as test T2, because it follows the standard CBR test T1. The plunger starts applying stress until that penetration and then it returns. Stress during test T2 (σ_2) is too high so the reached values exceed the capacity limit of the soil. The exceeding of the capacity limit of the soil was observed also at the end of the standard CBR test as seen in Table 1 σ_{CBR5}.
As cyclic test T2 exceeds the capacity of the soil, Resilient Modulus and Young's modulus cannot be calculated correctly. For that reason, test T3 was developed at the Mendel University in Brno in cooperation with geotechnical laboratory GEOSTAR, s.r.o.. In this test, the main difference is that applied stress is defined by the maximum capacity limit of the soil. In examined case the applied stress is of the soil was 210 kPa (Table 2) and maximum deformation can be obtained.

Conclusion

Data obtained from CBR test shows clearly that test T2 according to Dutch theory cannot describe correctly deformation behaviour of soil after the application of load because limit is exceeded. Whereas test T3 simulates real conditions that roads suffer while vehicles pass through them and it also respects the maximum capacity of soil. The value of Resilient Modulus corresponds to requirements of numeric models based on FEM method.

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Acknowledgment

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Souhrn
Nízkokapacitní vozovky LVRs v sobě zahrnují jak cesty účelové, vozovky lesní a polní dopravní sítě, tak i komunikace využívané k volnočasovým aktivitám. Na rozdíl od veřejných komunikací, nízkokapacitní vozovky prochází řadou chráněných území, která se často vyznačují složitým vodním režimem s negativními důsledky na únosnost podloží, na druhé straně disponují vysokým rekreačním potenciálem. Tím se zužuje prostor výběru technologií i materiálů pro výstavbu vozovek. Současně však zůstávají vysoká kritéria na spolehlivost, životnost a finanční efektivitu. Kvalitní spolehlivostní návrhy konstrukcí se již neobejdou bez výpočetních numerických modelů a výstižném stanovení potřebných materiálových charakteristik, zvláště modulu pružnosti podloží, který by adekvátně reagoval na změny vlhkosti podložních zemin, a současně byl kompatibilní s použitým numerickým modelem.
Těmto požadavkům vyhovují moduly pružnosti (Resilient modulus MR) stanovené z cyklických zatěžovacích zkoušek, při kterých je simulováno zatížení opakující se dopravou. Jedinou zkouškou pro jeho stanovení je cyklický triaxiální test, který je ovšem pro svoji náročnost v běžné praxi, zvláště v návrhu vozovek LVRs, nedostupný. Alternativní zkouškou je od roku 2008 i cyklický test CBR, který byl testován a rozvíjen v laboratoři Mendelovy Univerzity v Brně a v geotechnické laboratoři GEOSTAR, s.r.o. Brno. Cyklický test CBR představený nizozemskou univerzitou Delft University of Technology je založen na opakovaném zatěžování při konstantní penetraci. V textu byl značen jako test T2. V průběhu ověřování jeho realizace byl modifikován na test T3, kdy opakované zatěžování bylo prováděno za konstantního napětí. K modifikaci původního testu došlo z důvodů překračování hodnot napětí na penetračním trnu při testu T2. Byly zjištěny hodnoty napětí, které více jak desetinásobně překračují hodnoty únosnosti sledovaného materiálu. Test T2 byl tedy upraven na zatěžování při konstantních hodnotách napětí, které jsou stanovovány dle maximální únosnosti zeminy R_d. Modul stanovený stanovený tímto způsobem před porušením zeminy, na intervalu budoucího zatížení splňuje požadavky kladené na tuto veličinu

Annexes

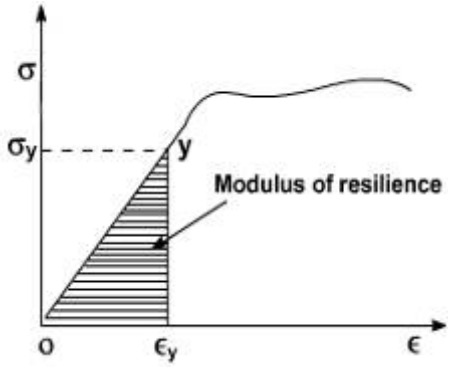

Fig. 1: Graphic of stress vs. Deformation showing modulus of resilience M_R

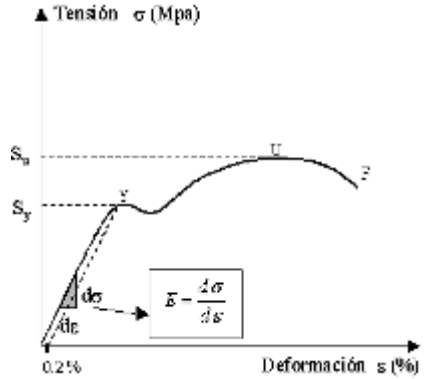

Fig. 2: Graphic of stress vs. Deformation showing Young's modulus

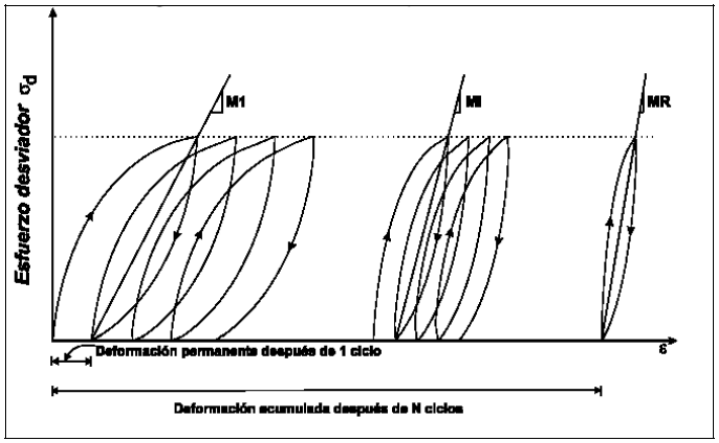

Fig. 3: Resilient Modulus obtained from the CBR cyclic test

Tab. 1: Results obtained from cycli CBR test T2

Soil	Profile	Clasiff.	W_{op} [%]	ρ [kgm^{-3}]	σ_2 kPa	M_{R2} MPa	R_d kPa	σ_{CBR5} kPa
Borovice	P-1	F8 CH	24,8	1471	1364,1	133,1	246,8	924
	P-2/3	F5 ML	15,1	1780	1523,6	172,8	370,2	3628,2
	P-4	F6 CI	16,4	1752	1429,4	195,2	308,5	2814,8
	P-6	F6 CI	16,7	1747	133,1	172	308,5	2488
Navojna	P-1	F8 CH	24,6	1492	748	81,7	246,8	1305,1
	P-2	F2 CG	23,1	1548	710,3	81,8	370,2	1291
	P-5	F2 CG	24,6	1475	863,6	252,2	370,2	1606,3
	P-9	F8 CH	21,3	1626	1184,8	376,9	246,8	1666,7
	P-10	F8 CH	20,3	1610	1977,6	300,5	246,8	3052
Nove Mesto	P-1	S4 SM	14,4	1847	1554,2	180,8	313,6	5012,5
	P-3	S4 SM	12,9	1878	680,8	63,3	313,6	2892,7
	P-4	G4 GM	16,2	1769	249	38,8	294,7	847,4
	P-5	S3 SF	15,3	1723	1043,3	101	5,3	4466,7
	P-6	S4 SM	15,7	1757	1217,2	142,8	313,4	3346,8
	P-7	S4 SM	14,6	1860	414,1	39,4	313,4	1043,4
	P-8	S4 SM	13,3	1881	1227,4	161,8	313,6	2572,9
	P-9	S3 SF	13,4	1784	1402,9	100,8	5,4	5627,4
	P-10	S4 SM	15,4	1708	490,7	47,1	313,3	1255,6
Rasna	P-3	S4 SM	14	1852	1422,1	337,2	313,3	3507,4
	P-6	S4 SM	12	1938	1126,5	156,1	313,7	4835,2
Kultury	P-2	F8 CH	22,9	1594	443,6	46,4	246,8	692,6
	P-5	F8 CH	22,2	1572	797,2	111,7	246,8	1177,5
	P-6	F8 CH	23,5	1576	583,6	98,4	246,8	735,4
	P-7	F8 CH	22,8	1576	436,2	44,7	246,8	657,3
	P-8	F8 CH	20,8	1630	702,9	66,7	246,8	1273,3
	P-9	F8 CH	27,3	1493	380,2	51,7	246,8	526,1
	P-10	F6 CI	25,5	1492	287,4	21,9	308,5	468,6
Kubenka	P-4	G4 GM	11,5	1988	114,9	11,9	295,1	297,7
	P-6	G4 GM	11,5	1970	160,6	17,1	295	398

Tab. 2: Results obtained from cycli CBR test T3

Soil	Profile	Class.	W_{op} [%]	ρ [kgm^{-3}]	σ_2 MPa	M_{R2} Mpa	σ_3 Mpa	M_{R3} Mpa	R_d kPa	σ_{CBR5} kPa
Kubenka	P-7	G4 GM	9,8	2134	400,8	45,6	210	36,8	294,8	1043,4
	P-8	F4 CS	11,4	2171	847,2	39,7		99,8	308,5	1689,5
	P-10	S4 SM	11,2	2043	438,6	22,2		21,7	313,4	794,3
	P-11	F3MS	13	2079	386,1	38,7		27,8	370,2	810,5
	P-12	S5 SC	5,9	2250	415,6	59,5		61,9	323,5	2064,6
	P-13	F3 MS	5,3	2202	539,4	66,7		34,3	370,2	1674,1
	P-14	F4 CS	10	2126	649,9	79,8		118,5	380,5	1566,5

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METHODOLOGY OF COPPICE BIOTOPES SUITABILITY ASSESSMENT FOR ORGANISM'S SPECIES FIXED ON COPPICE DEFINED ENVIRONMENTS

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Abstract

The presented methodology is a simple tool for assessment of coppice biotopes suitability for species bound to coppice defined environments. User of the methodology can choose one of three standard models of coppicing and two models of coppice-with-standards management. Models of management are specified by: a) length of production cycle (rotation period), b) interval between cutting interventions, c) intensity of cutting interventions. User can, with respect to interpretation of physical parameters effect and environment characteristics as a result of the management model, assess response of selected species or group of species to the development phases of forest. The result of evaluation is if standard model of coppice management are for assessed species: a) suitable, b) partly suitable or c) unsuitable. When the standard models are partly suitable for selected species, the user can define problematic phases of forest development and propose alternative ways of management with using the starting points of the models. There are also examples of reaction of selected species on standard coppice models presented in the methodology.

Key words: coppice, coppice-with-standards, biodiversity, management

Introduction

The renaissance of interest in coppicing can be seen at present. Coppicing was accepted as the relevant approach to forest management at past but especially in consequence with requirement of wood production intensification the coppicing was abandoned in most of forest management units. One of the arguments for repeating introduction and using of coppiced forest not only in Czech Republic is among others effort to forests biodiversity strengthening. Increasing proportion of coppiced forests should cause increasing proportions so called bright or opened forests (Buckley 1992; Harmer, Howe, 2003). The production of fuel wood and high-quality wood sections from coppiced forests is also important argument (Kadavý et all,. 2011). Although the principles of coppice management are generally known (Konšel, 1931; Polanský, 1947; Utinek, 2009; Kadavý et all. 2011), reaction of most of the organism's species fixed on coppice defined environments has been still the great unknown variable. The ambition of presented article is to present easy tool proposed by authors for simplification of biotopes suitability assessment just for those organism's species whose are fixed on coppice defined environments.

Materials and methods

Methodology is designed for important organism's species potentially occurring within the forest sites where coppicing can be carried out. As for the coppiced forests on this sites, they are planned to be planted in certain proposed management models of coppicing in frame of presented methodology.

As important organism's species should be selected those organism's species which meet criterions as follows:

- represent wider group of species or in optimal case are representatives of some specific communities
- their importance in the field of nature protection is given generally for example by their including to the lists of protected or rare species according to different documents (e.g. Procházka (2001); Farkač a Král (2005); Grulich (2012); Direction no. 395/1992; appendix II of the Directive 92/43/EHS etc.)

Forest sites suitable for coppicing are presented in following table (tab. 1).

Tab. 1: Forest sites suitable for coppicing

Site Quality	Site type (forest typology)	Target management group
excellent	1L, 2L, 1U, 3U, 3L, 5L	19
	1H, 2H, 1B, 2B, 1D, 2D - excl. exposed types	25
	1W, 2W, 1V, 2V, 1O, 2O, 1S, 2S	25
	1T, 1G	25
	3S, 3B	45
	3D, 3H, 4H	45
very good	1N, 2N, 1A, 2A (pure types), 1C, 2C, 3C, 3N, 4N (exposed types)	21
	2M, 2K, 3M, 2S, 2B, 2D	21
	1P, 2P, 1Q, 2Q, 3Q, 4Q, 3P	27
	3C, 4C, 5C, 3A, 4A	31
	3W, 4W	35
	3N - excl. pure types, 3F, 4F	41
	3K, 3A, 4A - exposed types	41
	4H, 3S, 4S, 3B, 4B, 3D, 4D	45
	3V, 4V - excl. waterlogged types, 3O, 4O, 4P, 3P	47
good	1M	13
	1K, 2K, 1I, 2I, 2M, 3M - excl. exposed types	23
	1S, 2S, 3K, 3I, 1C, 2C, 3C	23
	3K, 3I - excl. exposed and pure types	43
	3S, 4S - pure types	43

The goal of the methodology is to give following possibilities to its user:

1. to present forest development stages (phases) according to the standard management models in coppiced forests on the level of forest stand
2. to assess reaction of important organism's species to the particular forest development stage defined by the management model of coppicing
3. to define if standard management model in coppiced forest are for assessed organism's species:
   a) suitable - it means that standard management model can be used
   b) partly suitable - it means that standard management model if is necessary to use must be adjusted regarding to assessed organism's species requirements
   c) unsuitable

Results

The methodology procedure is divided to following steps:

1. selection of standard coppice management model or models
2. selection of the important organism's species or group of organism's species
3. definition of reactions of important organism's species or group of organism's species to the standard coppice management model or models
4. results interpretation and management recommendations proposal

User of the methodology can work with several standard coppice models defined within the methodology. Then user have to select the length of rotation period of coppiced part of forest stand. It is recommended to use the length of rotation period from 10 to 30 years (40 years in maximum). There is a generally rule stated that if the forest site is reach (has higher quality) the length of rotation period of coppiced part of forest should be low and vice versa. Selection of the important organism's species or group of important organism's species should follow the rules given above (chap. Materials and methods) and should be done by the expert or experts with local experiences in ideal case.

The reaction of the important organism's species or group of important organism's species in relation to the forest development stage (phase) according to the presented coppice management models have to be assessed by user according to the scale of proposed typical reactions of organisms to the environment conditions (see tab. 2).

For mentioned methodological procedure steps the basic template have to be used (see fig. 1). The proposed reaction of species or group of species is entered to it.

The result coming from the assessment carried out in the basic template is the statement of biotope's conditioned by using of some management model suitability for particular species or group of species life.

Tab. 2: Proposed typical reactions of organisms to the environment conditions in relation to the management models

Grade	Biotope´s suitability for organism´s life	Reaction to the management model
1	Conditions better than optimal	Management model provides conditions leading to potential expansion of population
2	Optimal conditions	Management model provides optimal conditions for the species existence leading to potentially optimal status of population
3	Indifferent conditions	Species have no reaction to the management model´s interventions
4	Negative conditions	Management model provides conditions leading to potential decreasing of population
5	Lethal conditions	Management model provides conditions leading to potential decline of population

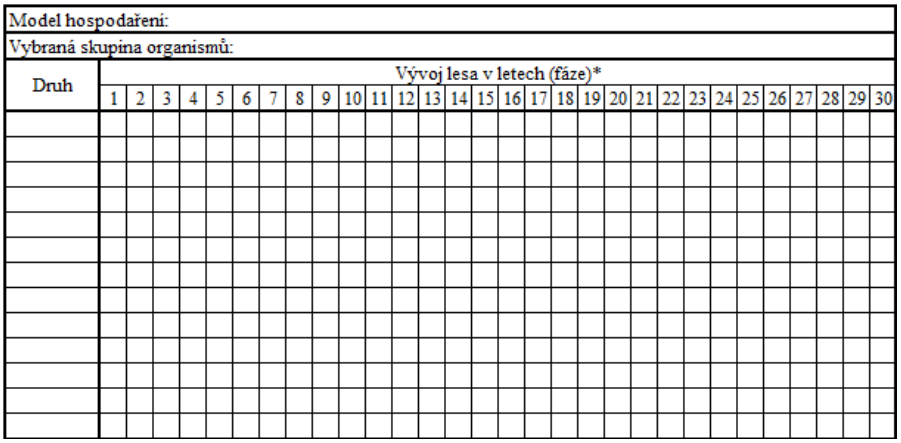

Fig. 1: Reprint of basic template of methodology

Conclusion

Article introduces methodology of coppice biotopes suitability assessment for organism's species fixed on coppice defined environments, where authors' main goal was to create simplified tool for assessment of biotope´s determined by coppicing suitability for important organism´s species.

The methodology procedure is divided into following steps:

1. selection of standard coppice management model or models
2. selection of the important organism's species or group of organism's species
3. definition of reactions of important organism's species or group of organism's species to the standard coppice management model or models
4. results interpretation and management recommendations proposal

User of the methodology can work with several defined coppice management models. For important species reaction assessment so called basic template have to been used. The template is used for actual suitability of biotopes assessment with using five grades scale (from 1 - living conditions of important species better than optimal to 5 - lethal living conditions of important species). Methodology also recommends forests sites suitable for coppicing wit differentiation from good to excellent. It is supposed that methodology can serve as tool for the nature protection managers and field workers.

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Příloha II směrnice 92/43/EHS ze dne 21. května 1992 o ochraně přírodních stanovišť, volně žijících živočichů a planě rostoucích rostlin.
Vyhláška č. 395/1992 ministerstva životního prostředí České republiky ze dne 11. června 1992, kterou se provádějí některá ustanovení zákona České národní rady č. 114/1992 Sb., o ochraně přírody a krajiny ve znění pozdějších předpisů.

Acknowledgement
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Souhrn
Článek představuje metodiku hodnocení vhodnosti biotopů nízkého a středního lesa pro druhy organismů vázané na tato prostředí, kdy cílem autorů bylo vytvoření jednoduché pomůcky pro hodnocení vhodnosti biotopů nízkého a středního lesa pro významné druhy organismů vázané na tyto hospodářské tvary lesa.
Vlastní metodika hodnocení se skládá z následujících na sebe navazujících činností:

- výběr standardního modelu nebo modelů hospodaření v nízkém a středním lese,
- stanovení významného druhu nebo druhů,
- definice reakce významného(ých) druhu(ů) na model(y) hospodaření v lesním prostředí,
- kumulace významných druhů podle typu jejich reakce na stav a vývoj prostředí,
- interpretace výsledků a návrh managementových doporučení pro vybraný druh či skupiny významných druhů.

Uživatel metodiky má možnost výběru ze tří standardních modelů nízkého lesa a ze dvou modelů lesa středního a má tak k dispozici dostatek informací k tomu, aby mohl adekvátně posoudit reakci vybraného druhu či skupiny druhů na konkrétní vývojovou fázi modelu hospodaření. K hodnocení možných reakcí významných druhů na modelem hospodaření vzniklé biotopy uživatel metodiky používá "základní formulář metodiky". Ten slouží k hodnocení aktuální vhodnosti stavu biotopu pro významný druh s využitím pětibodové stupnice hodnocení (1-podmínky nad rámec optimálních až 5-likvidační podmínky druhu). V případě nutnosti hodnocení reakcí většího množství významných druhů na uživatelem zvolený model hospodaření je doporučováno použít tzv. kumulace druhů. Metodika doporučuje vhodná stanoviště pro hospodaření ve tvaru lesa nízkého a lesa středního. Předpokládáme, že své uplatnění nalezne metodika především v řadách pracovníků se zaměřením na ochranu přírody a krajiny, dále u odborného lesnického personálu včetně pracovníků hospodářské úpravy lesů a státní správy lesů.

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METHODS FOR VISITOR MONITORING IN PROTECTED AREAS

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Abstract
In most European countries, visitor monitoring is a well-established tool for protected areas management. Increasingly, the management of protected areas in the Czech Republic has led to a growing demand for high-quality data on visitors. There exists a wide variety of methods of visitor monitoring, but the most frequently applied ones in the Czech Republic are the automatic and personal counting – usually ignoring other alternatives.
The study presents a systematization of visitor monitoring methods employed in the Czech and foreign protected areas, together with a discussion on the survey purposes, strengths and weaknesses of the data collected using particular methods. The aim of the study is to increase the portfolio of considered visitor monitoring options in the Czech setting. We hope to enhance the discussion on the application of monitoring methods and conditions under which they allow to produce high-quality data and to show which method may prove useful in each specific monitoring task, considering the characteristics of the protected area, visitor population and the purpose of the survey.

Key words: visitor survey, visitor counting

Introduction

Management that keeps in balance care of precious natural localities and species and offers of recreation is the basic prerequisite for sustainable tourism in protected areas (PA). However, such management requires information about the numbers of visitors, their characteristics, activities, attitudes and opinions. Therefore demand for high-quality data on visitors has increased and it raises the question which monitoring method to use. Therefore we aim at a comparison of available visitor monitoring methods with respect to their representativeness, detail of the provided information, usability for spatial and temporal aggregation and thus suitability for a monitoring action with particular purpose in the Czech setting.
There exists a variety of methods of visitor monitoring, but the most applied in the Czech Republic are the automatic and personal counting and on-site questionnaire survey. The automatic counting has for instance been applied in the Krkonoše National park (KRNAP), PLA Beskydy, PLA Jeseníky and several information centres in protected areas. The personal counting has been repeatedly applied between 1997 and 2010 in Šumava National Park (NP) and Podyjí NP (Najmanová and Čihař, 2006). Also several questionnaire surveys have been conducted on-site with the aim to investigate visitors' attitudes and perceptions, their socio-demographics or e.g. environmental awareness (Kolpron, 2005, Třebický and Čihař, 2006, Görner and Čihař, 2012) or generally on tourism with focus on satisfaction with local services (CzechTourism, Ipsos Tambor 2009; 2014). To our knowledge the only off-site survey was conducted in PLA Jizerské hory by Melichar and Urban (2008). From the new monitoring methods mobile signalisation data have been applied but mostly for the monitoring of visitors of cultural heritage sites, an exception is The monitoring of thenumber of visitor's in Kvilda by mobile signalisation data in 2012 and 2013 (CE-Traffic a CzechTourism, 2013).
Despite the available data on visitor numbers and their characteristics any systematic comparison of monitoring methods has been so far missing. Therefore we aim at a systematization of visitor monitoring methods that may be applied in the CR for the visitor monitoring in protected areas. Our analysis is based on the experiences from other countries and preliminary results of an empirical study on tourism in two PA localities, i.e. Hruboskalsko in PLA Český ráj and the central part of Šumava NP. In this study several monitoring methods were applied simultaneously to compare so that their usability for different monitoring purposes and measurement accuracy could be compared.

The purpose of the monitoring and available methods

Before any administration starts planning visitor monitoring action it should be clear what the purpose of the data collection is. The following purposes are most frequent (adapted from SEPA, 2007):

1) Monitoring of visitors in localities with endangered species and habitats;
2) Monitoring of spatial distribution of visitors into an area for identification of: a) crowded localities; b) localities with colliding activities (e.g. bicyclist and hikers); and c) access to various performance groups;
3) Monitoring of demand for visitor infrastructure (parking places in particular);
4) Monitoring of demand changes due to regulatory or marketing measures;
5) Monitoring of potential changes in recreation demand.

Depending on the purpose the monitoring may focus on changes of natural objects, visitor numbers, spatial and temporal distribution, recreational activities, visitors' characteristics, attitudes, etc. (Jelečková, 2012; Muhar et al., 2002).
There are several typologies of visitor monitoring methods in the literature. SEPA (2007) distinguishes the monitoring primarily according to: i) the place of data collection, i.e. on-site and off-site; and ii) the source of the data and used technologies: a) indirect, b) direct and c) automatic methods of monitoring. Another typology distinguishes the type of the monitoring data, i.e. a) qualitative, b) opinion, c) quantitative (Cope et al., 2000; Melville a Ruohonen, 2002). *On-site monitoring* is a counting or questioning of visitors, who could be found at the time of monitoring on the target area. Such monitoring is especially suitable for investigating the current loads on tracks or experiences from the current recreation. Contrarily, the *off-site questioning* is the survey of the general population and thus also those who do not visit the area.
Indirect monitoring methods are based on the manifestation of wearing out (of tracks, pathways, vegetation) or data that have been collected for other purposes (sold entrance or parking tickets, visitor books, etc.). *Direct methods* are based on manual observation by personnel; automatic on mechanic or electronic counters.
Whereas *quantitative monitoring* aims only at numbers of visitors (collected manually or automatically, with or without video recording), the *qualitative* investigates also visitors' characteristics, perception, opinions and wishes.
The methods employing *the new information and communication technologies* (ICT), such as GPS or signalisation data from mobile operators has become more common in last years (CE Traffic a CzechTourism, 2013, Eurostat, 2013). Since the particular examples of the methods come under more than one from the above mentioned categories, to facilitate the orientation we systematize them into Table 1.

Tab. 1: Available monitoring methods in protected areas

Ref.:	*SEPA 2007*	*Melville a Ruohonen 2002*	*SEPA 2007*	*Adapted from (LVAF 2012)*
	Sampling type	**Type of data**	**Data source and technology**	**Examples of methods**
	On-site	Other	Indirect	Sample plots Photo and video monitoring of objects Visual monitoring of objects
		Quantitative		Records collected for other purposes (visitor books, parking data, sale of tickets, etc.)
			Direct	Manual observation of visitors from land / personalized monitoring
				Manual observation of visitors from air
		Opinion		Questionnaire survey
				Personal interviews (face-to-face)
		Qualitative		Questionnaire survey
				Personal interviews (face-to-face)
		Quantitative	Automatic	Automatic counter visitor monitoring
	Mixed			Location monitoring with GPS technologies
				Monitoring using mobile signalization data
	Off-site (general population)	Quantitative / qualitative / opinion	Other	Questionnaire survey - off site
		Quantitative	Automatic	Numbers of visitors of web-pages, QR-codes, number of geo-cache registrations, positionin of photos, blog and visited trails on web, etc.

Further we compare five most prominent types of visitor monitoring methods: i) automatic counter monitoring, ii) personal monitoring and iii) personal interviews, iv) off-site questionnaire survey, and iv) monitoring using mobile signalisation data.

Comparison

The essential question for the optimal use of visitor monitoring is what the data collected by means of the particular method represent. The *automatic counter* (and mostly also personal monitoring) counts numbers of passing through a profile, i.e. "pairs-of-feet". It means that if we want to know the numbers of unique visitor on-site, the counted number needs to be corrected for repeated passings of the same visitor. For instance from our counting profile at the entrance of Prášilské Lake in Šumava NP (Liščí díry) the automatic counter (on Sunday 10th August, 2015) provides the number 465, whereas the personnel counts only 290 unique visitors either coming from or leaving to the profile. Thus the division factor is 1.6 at this particular profile. However, the division factor is mostly un-known, and another monitoring method must provide it. The double counting is a significant issue for aggregation of the counts for both a larger area – because the same visitor passes more monitoring profiles - and a longer time period– because (s)he passes the same profile repeatedly. Still the numbers from the automatic counters are good indicators of the load on a particular track that can be used for optimisation of environmental stress or crowding problem in particularly localities. Moreover, it is the most suitable method for long-term counting and seasonal variations since the length of the monitoring period has a relatively limited effect on the costs.

The *personal monitoring* does not differ in representativeness from the automatic counter. Its main advantage is that it allows collecting more detailed data. Thus we know that the total number of 307 visitors at Prášilské Lake on a concrete day came in 126 groups, i.e. with average group size 2.44, and that 9 out of these groups brought small children unable to walk the whole trip. Moreover the personal monitoring at a profile with two entrance tracks, such as Prášilské Lake, allows counting all visitors that would otherwise require two automatic counters. However since the costs for personal monitoring rise proportionally to the number of (person-) days this method is suitable only for short-term monitoring.

Contrarily to both the above described methods the *personal interviews on-site* represents just visitors of the area. Since it is impossible to make interviews with everybody the sampling poses the major pitfall of this method. To create a representative (random) sample a sampling frame is required, i.e. at least estimated numbers of visitors at individual localities of the area in question. This is even more complicated in large areas such as central part of Šumava NP, where are innumerable localities (and entrance profiles). And as the lack of information on visitors is the dominant reason for the monitoring these numbers are mostly unknown. Even if we succeed to sample randomly we face the problem of overrepresentation of frequent and long-term visitors, since these have a higher probability to be sampled. The sampling difficulties together with the endogeneous stratification problem, i.e. that the sample includes only people who are just present in the locality and who are more probably keen visitors of nature, may inflate estimated recreation values for the locality (González-Sepúlveda, Loomis 2010). Yet, assuming we have a representative sample, then the personal interviews on-site enable to investigate visitors' experience, recreation quality perceptions, etc. and importantly information on spatial distribution in the area, use values of the respective ecosystems' services and recreational demand of the visitors. Furthermore the on-site interviews represent the less expensive variant of the visitors' survey.

The unbiased estimates of recreational demand of a broader region population, investigation of determinants of and barriers for the visit and non-use values of ecosystem services are the main justifications for *off-site questionnaire survey*. The data collected at households are representative for the general population and thus it is not necessary to correct the (willingness-to-pay and other) estimates for the above described sampling biases. On the contrary only the off-site gained values allow correcting the on-site estimates also for preferences of non-visitors. The representative data on more than one visited localities, frequency of visits and their duration enables both spatial and temporal aggregation of visits. The biggest drawback of the methods is that even a large sample from the general population - let say population of the Czech Republic - contains relatively small share of the people who have recently visited the area of interest. In our study 19% (N=345) and 18% (N=330) of the total sample (N=1800) visited Hruboskalsko in PLA Český ráj and Třijezerní moor in Šumava NP, respectively during the summer season 2014. Thus the estimates for the group of visitors of the area(s) in question may be less robust than from the on-site survey. To minimize the problem of small share of visitors the off-site survey requires a larger sample which makes this method relatively costly.

The last method included is a relatively new method, i.e. *monitoring using mobile signalisation data*. The data collected by mobile phone operators aim at (anonymous) representation of unique visitors. Obviously a recalculation is needed so that the data on the presence of the particular mobile phone users in the monitored areas could be related to the general population. Even though the recalculation procedure raises concerns about the representativeness of this method, its potential lies in coverage of larger areas and possibility to discover the trip duration, visitor's residence and spatial distribution of

the visit in a large-scale. In our study we monitored cross-visits in cadaster area of four municipalities in Šumava NP: Modrava, Kvilda, Prášily and Stožec. For instance the Modrava area covered the area which would have to be monitored by at least 7 automatic counters. Since unique individuals are monitored the method is also suitable for temporal and spatial aggregation of the total number of visitors. The data collection may be administered "from the table". The costs and information on the visitors and uncertainty regarding the recalculation of the data are so far the major impediments for a broader utilization of this method. More detailed comparison of all described methods is in Table 2.

Tab. 2: Strengths and drawbacks of visitor monitoring methods

	Automatic counter	**Personal monitoring**	**Personal interviews - on-site**	**Questionnaire survey - off-site**	**Monitoring using mobile signalization data**
Most suitable for...	*long-term counting of visitors on tracks and seasonal variation*	*short-term counting of visitors, groups and their characteristics*	*investigation of users' experience, opinions, wishes, use values of ecosystems, recreational demand and spatial distribution in a broader area*	*identification of determinants of visit, incl., barriers, substitutional effects, recreational demand, non-use values of ecosystems*	*short- to middle-term counting of visitors in broader area, identification of the visitor's origin; from table realisation*
Evaluation criteria:					
I. Representative for...	Visitors on a track: "pairs of feet"	Visitors on a track: "pairs of feet"	Visitors on a track	General population of a region, e.g. Czech Republic	Visitors (unique individuals) in broader areas, e.g. Modrava or central part of Šumava NP
Sampling and its pitfals	No	No	Yes - necessitates sampling frame, i.e. estimated visitor numbers that are often unknown; systematic sampling overrepresents frequent visitors	Yes - possibly representative for every type of visitors and non-visitors; small share of visitors of the area in question in the national sample	No; necessitates correction from the users of one mobile phone operator to the whole population
II. Detail of the information:					
Direction	Yes	Yes	Yes	No	No
Group size	No	Yes	Yes	Yes	No
Group structure	No	Yes	Yes	Yes	No
City/ county of origin	No	No	Yes	Yes	Yes
Hikers vs. bicyclist	Yes	Yes	Yes	Yes	No
Trip duration	No	No	Yes	Yes	Yes
Trip frequency	No	No	Yes	Yes	No
Spatial distribution in small-size area (e.g. Hrubokalsko)	No	No	Yes	No	No
Spatial distribution in large-size area (e.g. NP Šumava)	No	No	Yes	Yes	Yes
III. Aggregation:					
Spatial (e.g. NP Šumava)	Not possible due to double counting problem	Not possible due to double counting problem	Possible if the data on all visited localities are collected, so that the counts could be corrected for double counting	Possible if the data on all visited localities are collected, so that the counts could be corrected for double counting	Possible - however not in small spatial detail
Temporal (e.g. yearly visits)	Not possible for individuals but passings	Not possible for individuals but passings	Possible if the data on all visits and their duration are collected, so that the counts could be corrected for double counting	Possible if the data on all visits and their duration are collected, so that the counts could be corrected for double counting	Possible

Discussion

The decision for a particular monitoring method should further consider its accuracy. This issue raises another relevant questions such as if the automatic counters really include everybody, if it is suitable for the profiles of interest, whether the personnel manages to notice all people who pass most crowded profiles. Unfortunately these issues are out of scope of this paper. They will be however taken into account in the methodology of visitors' monitoring planed as the main outcome of this project.

Conclusion

The paper compares five direct visitors' monitoring methods that may be considered by the management of protected areas. Their characteristics with respect to representativeness, detail of the information and aggregation potential and thus suitability for monitoring actions with different purposes are discussed.

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Souhrn
Tento článek porovnává nejčastěji používané metody monitoringu návštěvnosti zvláště chráněných území, tj. automatický monitoring, osobní monitoring, osobní rozhovory v místě, dotazníkové šetření obecné populace a monitoring s využitím signalizačních dat mobilních operátorů. Tyto metody jsou porovnány z hlediska toho, co sebrané počty reprezentují, v jakém detailu sbírají data a nakolik umožňují agregaci v čase a prostoru. Monitoring s využitím automatických a osobních sčítačů poskytuje data o „párech nohou“, které procházejí po monitorovaných stezkách. To představuje jistá omezení agregace těchto počtů v čase i prostoru. Počty unikátních návštěvníků, které lze dobře agregovat, získáme nejlépe s pomocí dotazníkového šetření obecné populace anebo ze signalizačních dat mobilních operátorů. Dotazníkové šetření navíc představuje nejlepší způsob sběru, chceme-li identifikovat bariéry návštěv, rekreační poptávku a ne-užitné hodnoty ekosystémů. Hlavní kladem osobních rozhovorů v místě rekreace je vysoký detail získaných dat, možnost zjišťování prostorové distribuce návštěvnosti v malém územním detailu a relativně nižší náklady.

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METHODOLOGICAL PROCEDURE FOR THE ECONOMIC ASSESSMENT OF THE TFE IMPORTANCE IN LOCAL ECONOMY

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Abstract
The paper describes a methodical procedure, which will be used to deal with the economic part of the Internal Grant Agency project of the Faculty of Forestry and Wood Technology at Mendel University in Brno in 2015. The project is related to research, which was conducted in the Training Forest Enterprise Masaryk Forest Křtiny (TFE Křtiny) area in 2013 and 2014. The aim of this research was to find usage possibilities of an alternative method to evaluate a recreational potential of the area of interest. In 2015, the economic part of research is focused on economic assessment of the TFE Křtiny importance in local economy. The need for dealing with this issue originates in growing social demands on forestry, and nature and landscape protection to develop the countryside – these demands are stated for example in international strategic objectives of sustainable development. The methodology of local multiplier calculation (LM2, LM3) will be verified within the frame of the same research. The methods of a standardized interview, analysis, comparison, consolidation and synthesis will be used. The methodical procedure for local multiplier calculation consists of four parts – a definition of the area of interest, LM2 calculation, and standardized interview and LM3 calculation.

Key words: economics, methodology, local multiplier, forestry, recreation function

Introduction

Research was carried out in the area of Training Forest Enterprise Masaryk Forest Křtiny (TFE Křtiny) in the years 2013 – 2014 focusing on the quantification and evaluation of the area's recreational utilisation. The objective of the research was to determine the possibilities of utilising an alternative evaluation method of the recreational potential of the area of interest. On the research participated the staff from the Department of Forest and Wood Products Economics and Policy (DFWPEP), Department of Landscape Management (DLM) and Department of Forest Management and Applied Geoinformatics. Part of the research involved a questionnaire survey in the forest district of Bílovice nad Svitavou. The economic part of the research focused on determining the level of travelling expenses of visitors and their willingness to pay for services provided by forest ecosystems and the application of the local multiplier methodology. In 2015 DFWPEP and DLM obtained an internal grant project, which continues with the research activities of 2013 and 2014. The objective of the project is to quantify and evaluate the socioeconomic effects of the forest enterprise on the local economy. The article will describe the methodical approach which will be applied to the economic evaluation of the importance of TFE Křtiny to the local economy.

Material and methods

The materials for this article were obtained with the aid of secondary research that focused principally on the literary search of available domestic and foreign sources from the sphere of sustainable development, economic localisation, evaluation of the contributions of enterprises to the local economy and the calculation of the local multiplier. The project entitled "The Importance of TFE Křtiny for the Local Economy" emerged as a response to the hitherto unresolved problems of the local economy in the branch of forest management (FM), nature and landscape conservation which are derived from the objectives presented in sustainable development strategic documents on a national and international scale. Important sources of information about the objectives of the sustainable development strategy, principally focusing on interconnecting the economic, social and environmental pillars of sustainable development were Agenda 21, Local Agenda 21, and Strategic Framework for Sustainable Development and documents of the United Nations. The enhancement of socioeconomic aspects of the sustainable development of FM is presented in Resolution L1 of the Third Ministerial Conference on the Protection of Forests in Europe (Lisbon, 1998). The National Forestry Programme II is important in terms of the Czech Republic and the importance and impact of small and medium enterprises on employment, the economy of suppliers and customers in the regions. Description, analysis, synthesis and comparison were the methods applied in the article.

Results

The project's primary objective is to quantify and subsequently evaluate the impact of a special-purpose forest enterprise and forest management on the economic and social development of the area with the application of the local multiplier calculation methodology, and to determine potential cash flows associated with the fulfilment of socioeconomic functions of forest ecosystems in the area of interest of the TFE Křtiny. The principal objective of the project will be to achieve mutual consolidation and synthesis of outputs of the project's partial objectives. The project's economic partial objectives are to test the local multiplier 2 (LM2) and local multiplier 3 (LM3) calculation methodologies in the TFE Křtiny area of interest and determine the potential of socioeconomic functions of forest management for the economic development of the area of interest. The principal socioeconomic function examined in the project will be the recreational function.

The methods applied in the project's economic part will be the calculation of local multipliers LM2 and LM3, analysis, comparison, consolidation, synthesis and statistical analysis.

The local multiplier calculation methodology in the sphere of nature and landscape conservation was applied by Ing. Březina at the Podyjí National Park Administration (see Březina 2014). The project's objective is to test this methodology by applying it to the forest enterprise. The methodical procedure for local multiplier calculation consists of four parts – a definition of the area of interest, LM2 calculation, and standardized interview and LM3 calculation.

Part one – the definitiv of the area of interest – has already been carried out. The municipalities in immediate proximity to TFE Křtiny were selected as areas of interest for the project which are most affected by this enterprise. This is a total of 21 municipalities. The statutory city of Brno was excluded from the area of interest because the data from this area would greatly distort the results of the research.

The data required to calculate LM2 will be transformed from the TFE Křtiny information system. The LM2 will then be calculated according to Kutáček (2007a), where the total income will be added together of TFE Křtiny with the local expenses of TFE Křtiny and will be divided by the total income of TFE Křtiny for 2014.

The total income of TFE Křtiny consists of items of account class 6 – Revenues, especially the revenues of account category 60, 64 and 67). The local expenses of TFE Křtiny include expenses which were spent locally, i.e. those that the enterprise spent in the demarcated area of interest. In accounting terms these are data of account class 5 – Expenses, mainly account category 50 – Consumed Purchases, 51 – Services and 52 – Personnel Expenses.

When dealing with the economic part of the project the most time-consuming task will be to determine the data for calculating LM3. The data will be determined by a questionnaire survey that will be conducted in the form of a structured interview. The questionnaire survey consists of two parts. In the first part a questionnaire was drawn up for the employees of TFE Křtiny permanently residing in the area of interest. The objective of the questionnaire is to determine how the employees spend their money within and outside the area of interest. The questions in the questionnaire are based on the evaluation of family accounts used by the Czech Statistical Office. The questionnaire determines the data on the total income of the employees and the share that flows back into the area of interest, the local expenses. The second part will contain the major local suppliers generated from the TFE Křtiny information system from whom information will again be determined in the form of a questionnaire survey, or a structured interview respectively, about the level of expenses stemming from and to the area of interest. The questionnaire survey will establish the total local expenses of local employees and suppliers in the area of interest which will be used to calculate LM3. Local multiplier 3 represents the sum values of the total income of TFE Křtiny, local expenses of TFE Křtiny and local expenses of local employees and suppliers of TFE Křtiny divided by the value of the total income of TFE Křtiny. All data will apply to 2014.

Based on the determined results and results of previous research in this sphere carried out by various authors and a research team, the method of comparison, consolidation and synthesis will be applied to evaluate the socioeconomic functions of forest management and the usability of the local multiplier methodology in practice.

Discussion

At the beginning of the evolution, the sustainable development concept was focused on sustainability of enterprises and natural environment, respectively on the fact that the economy and the environment don't have to limit each other. (see e.g. United Nations 1973). The third dimension of sustainable development – social – was added later to the two dimensions – environmental and economic. Currently constantly greater emphasis is placed on the third pillar of sustainable development, i.e. the

social pillar by strengthening it at local level with regard to the economic and environmental pillar. Economic localisation is engaged in combining the pillars of sustainable development at local level.
Shuman (2000) defined economic localisation. The issue of economic localisation was also addressed at the Faculty of Social Studies of Masaryk University in Brno, for example by Došek (2006); Johanisová (2007). Other authors who have been engaged over a long period with the issue of economic localisation are Douthwait (1996) and Kutáček (2007a, 2007b). Economic localisation is manifested in relation to the regional economy and policy – see for example Armstrong, Taylor (2000); Šilhánková (2012). The problem of economic localisation in the branch of forest management and nature and landscape conservation is a global problem. The need to increase the contribution of FM and nature and landscape conservation to rural development is presented in the strategic objectives of many documents dealing principally with sustainable development at national and international level (see e.g. United Nations 2014). However, none of the above-mentioned authors and publications deals with economic localisation in relation to forest management and nature and landscape conservation.
A tool called local multiplier (LM) is used to determine how big a share of the financial resources spent by any institution remains in the region concerned. This tool appeared in 2002 thanks to the British independent think tank New Economics Foundation (NEF) under the direction of economist Justin Sacks (Rejmanová 2014). For example, Kutáček (2007a,b); Johanisová (2008); Březina, Šafařík, Hlaváčková (2013) deal with the issue of local multipliers. The calculation methodology was applied to a small number of final papers such as Došek (2006); Březina (2014) and Sacks (2002) as an example of a foreign author. However, the local multiplier was not used in any of the mentioned publications to determine the contribution of a forest enterprise to the local economy.

Conclusion
The article presents the methodical approach that will be applied when dealing with the economic part of the internal grant project of the Faculty of Forestry and Wood Technology at Mendel University in Brno. The objective of the project is to quantify and evaluate the impact of a special-purpose forest enterprise and forest management on the economic and social development of the area.
The methods applied in the project's economic part will be the calculation of local multipliers LM2 and LM3, analysis, comparison, consolidation, synthesis and statistical analysis.
The results of the project will make it possible to quantify the role played by the forest enterprise in the local economy under the conditions concerned as one of the strategic objectives of forest management in the sphere of sustainable development. The outputs of the project will be used for further research in the evaluation of contributions of forest enterprises and organisations engaged in natural and landscape conservation to the local economy, quantification and evaluation of the function of the landscape and for the practical utilisation of the Training Forest Enterprise Masaryk Forest Křtiny in its operational activities.

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